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ABSTRACT

This handbook is primarily intended to serve as a primer for transit system managers who have not had any formal financial education through college classes, professional development programs, or extensive on-the-job programs. The following topics are covered: financial planning techniques for transit (beginning the financial planning process, turning strategy into a financial plan, budgeting, and coping with problems and pitfalls); accounting fundamentals (the accounting process, financial statements, working capital, cost analysis, break-even analysis, the cash and accrual basis of accounting, depreciation); budgeting (purposes of a budget, concepts in budgeting, budget preparation, internal preparation, external review, implementation, analysis techniques); cash control (the operator, the farebox, the vault, receiving vaults/ancillary equipment, vault handling and physical facilities, money counting, money room operators, funds transfer, other loss areas); inventory management (reasons for and requirements of effective inventories); risk management (elements of risk management, risk funding and decision making, property and liability insurance coverages, and establishment of a risk management policy); cash management (cash flow time lines, the concept of float, banking services, cash discounts, cash flow forecasts); debt financing (types of debt, planning and issuing debt); capital expenses (the time value of money, life-cycle costing, vehicle rehabilitation, tax benefit transfer); and automation in financial management. Appendixes explain various debt mechanisms and microcomputer applications. (MN)

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Financial Management for Transit
A Handbook

April 1985

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Financial Management for Transit:
A Handbook

Final Report
April 1985

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The principal authors from IUT's staff which participated in this project include: Mark Heaselden, Lennart Henriksson, Kent McDaniel, Peter Perreault, George Smerk, and Eve Wyatt. Other staff members contributing were Kevin Cordes and Leslie Cleveland. Administrative assistance and report coordination were provided by Maria Lee and Cheryll Fifer-Brown.

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INTRODUCTION

The transit industry has been in a state of financial crisis for several years and there is still no relief in sight. Decreasing sources of financial support, increasing costs, shifting governmental roles, and changing regulatory requirements are creating pressures on transit management to reassess existing assumptions and seek internal economics. Above all, this complex environment creates the critical need for sound financial management principles. Although financial management is frequently confused with accounting, it is far more than a means for tracking money flow. At its heart lies the allocation and management of an organization's financial, human, and physical resources: it thus creates a basic framework for managerial decision making. Ultimately every decision a transit manager makes has financial implications.

In response to this problem, the Institute for Urban Transportation/Center for Transit Research and Management Development at Indiana University (IUT) developed a ten day training course called "Financial Management for Transit." Since 1982, this course has been offered twice each year to financial managers from transit systems from all over the United States. Instructors for the course have been selected from experts in the transit industry and from faculty members of the Indiana University School of Business who have borrowed the proven techniques from private industry and adapted them for use in the public sector.

This handbook developed as a logical outgrowth of the "Financial Management for Transit" training course. IUT staff members used the training course notebooks as a base, along with other available studies and documents. From this material we developed a handbook which addresses many of the fundamental financial management issues that the transit industry faces. Each of the ten chapters addresses a separate financial topic and can be used by itself for a specific use, or the chapters can be used in conjunction to provide a comprehensive approach towards financial management. Despite the variety of topics, this handbook is not intended to encompass all of the financial management issues of the transit industry; nor can it completely cover any of the topics that are included. This handbook is merely intended to be a primer for transit managers that have not had the opportunity for a formal financial education, either through college classes, professional development programs, or through extensive on-the-job experience. We hope that some of the ideas presented in this handbook will be beneficial even to those financial managers who have had formal training and experience.

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CHAPTER ONE

FINANCIAL PLANNING TECHNIQUES FOR TRANSIT

Introduction

Financial planning in transit has always been important. From the very earliest private enterprise days of the industry to the present days of public ownership, there has been an obvious need to gauge carefully the resources needed for carrying out operations and to make the necessary capital investments to the transit property.

Financial planning is even more important in times when money is scarce. Management effort is always directed toward the scarce resource; when labor is short, the management of personnel function becomes an important factor. With mounting concern over fiscal problems in transit, management attention should be increasingly directed toward financial planning. What should be and what actually is are often two very different things; the financial planning that prudence and good management demand is often missing in transit, replaced by fiddling with budgets and cost-cutting programs that are simple reactions rather than carefully crafted events.

Financial planning is more difficult and more necessary at present because of the many financial uncertainties facing transit. While uncertainty is no stranger to the transit industry, it has taken on a new dimension. From a financial viewpoint, the federal aid program, begun in 1961, had continually expanded the number of programs and the federal funds available; for many years the trend was steadily upward. Since 1981 the level of federal support has actually diminished and the massive federal deficit suggests that this decline may continue into the future.

Local and state support of transit is another uncertainty. In recent decades, there have been substantial increases in state and local support for transit operations, capital, planning, and other programs--usually matching a federal grant--but this support tends to fluctuate with the condition of the economy. In bad economic times, when transit ridership and fare receipts usually fall, it is difficult for state and local government to provide additional funds for transit. Add local political conflicts between city and suburb, rising costs of labor and supplies, and citizen tax revolt, and the financial situation in transit is often a most trying one, all of which makes financial planning more important than ever.

The Beginning of the Financial Planning Process

Financial planning identifies needs, develops managerial strategies, helps make the best use of limited resources, helps reduce uncertainty, and many even help educate both public officials and the general public. A good financial plan must meet the needs of the present; however, it should also be prepared with an eye to the future and should be molded by the long-run plans for the transit property. With long-run as well as short-run considerations in mind, the strategic plan is the ideal starting point for the development of the financial planning process.

Most transit properties have no strategic planning process; indeed, they are typically innocent of a real financial planning process. What is presented here is an ideal situation, a norm to which, under the best of circumstances, transit properties should aim. What follows may appear too neat and too precise, but it is not wise to dismiss a concept or an idea that may be helpful merely because it is now uncommon in a given industry.

The long-range planning process for a transit property is most effectively carried out through the development of a strategic plan. Strategic plans normally arise from the wishes of a transit policy board to look beyond the immediate future. The need for long-range capital investment is often the spur to such planning. Equipment and machinery wear out and there is a need to maintain buildings and other fixed facilities. Experienced policymakers will begin to raise questions about heavy maintenance or capital replenishment needs, or new capital purchases, over the next two to five years, or even longer. But a strategic plan is much more than a capital investment plan; it integrates long-run and short-run investment decisions with operational and human resource decisions. A strategic plan many be animated initially by capital investment considerations, but it goes beyond planning.

The strategic planning committee that must be established by the policy-making board should work closely with the budget committee of the board and with the management team of the transit property. The budget committee should strive continuously to update the budget to conform to reality; likewise, the strategic planning committee should regularly survey the strategic plan and update it as needed to conform with better information and more knowledge of real-world conditions. Again, it is only honest to note that strategic planning committees--and strategic planning--are rare in the transit industry. It should also be noted that that lack of strategic planning is often unconscious decision to lock a transit property into the present, perhaps crisis-ridden, management pattern. The strategic plan, to the contrary, attempts to lay out the future over a period of between one and ten years, and to move the property forward to what it should be doing in the future, based on the best available information and a vision of how transit may best serve the community which is its home. Figure 1.1 is a diagram of the strategic planning process.

The strategic planning process begins with an analysis of the environment in which the transit property exists. This should include an assessment of the threats and opportunities that may lie partially hidden in both the near and more distant future. For instance, there would be a threat if either the federal, a state, or local government diminishes its support for transit. On the other hand, a strong local commitment to downtown redevelopment may be a good long-run opportunity for transit. Renewal is the sort of long-run venture with which transit can be closely identified and in which transit may play an important role.

Another major factor in the strategic plan is consideration of the basic assumptions to be used. This would include such assumptions as the continuation of certain levels of fiscal support, growth patterns in the city as it will affect the transit operations, geographic expansion, a move toward a rail system, the development of reserved freeway lanes for buses, or a reduction of service because of an expected sharp decline in population.

An assessment of the current situation of the property should be made. This is a measure of the material and human resources that are available to carry out whatever tasks are needed. The assessment should include current needs and also possible future needs and directions. While the future--or anything beyond one or two years--is difficult to assess, some things are rather clear: the need to replace buses or other rolling stock on a regular pattern is relatively easy to determine based on the economic life of equipment. Other aspects of a property that can be examined at this stage are employee turnover rates, retirement age and training of employees, the availability of information from whatever management information system is in place, and the image of the property as reflected by the local media.

Another step is an analysis of the market potential for the transit property. This includes an estimate of future travel demand and other community needs that may affect transit. These should be projected as solidly as possible and as far as possible into the future. In this category would come such things as community development and redevelopment efforts in which transit may or must play a role. This step is essential in eventually calculating fare revenues.

From the foregoing effort comes the development of goals and objectives, a process which should take account of all groups and jurisdictions that will be affected. The goals of the transit agency should not be hammered out in a vacuum. In formulating goals and priorities, input is necessary from the community and community leaders as well as from

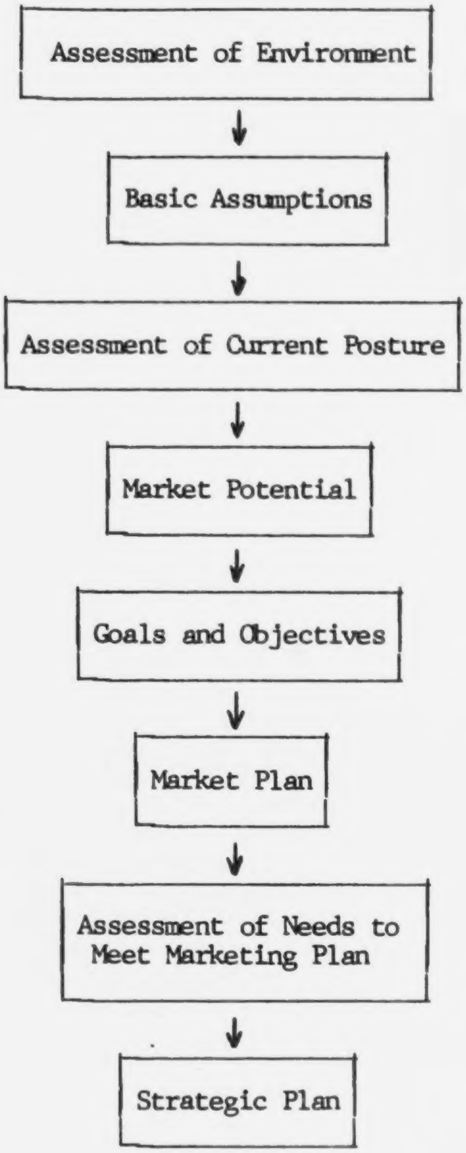

Assessment of Environment
Basic Assumptions
Assessment of Current Posture
Market Potential
Goals and Objectives
Market Plan
Assessment of Needs to Meet Marketing Plan
Strategic Plan

FIGURE 1.1 The strategic planning process.

transit management. The goals will be affected by the values of the community and the priority for various activities which are important to that community, in which transit may play a role. Within the transit organization, all levels of employees should have some input into the process, particularly the establishment of objectives. Broad participation is essential in evolving workable, practical objectives for each part of a transit organization and realistic timetables for the accomplishment of those objectives.

Policymakers should use the long-range nature of the strategic plan to establish long-range goals and action priorities. The shorter-range needs assessment, which is a part of any long-range strategic plan, is used to develop the shorter-range goals and priorities. The goals of a transit property establish ideal conditions and long-run aims. No goal in transit can probably be achieved quickly or by the accomplishment of any one of the objectives that flow from the goal, objective, action, and process. Objectives are much more specific and shorter run in nature and flow from the goals. The sequence of effort to achieve various objectives is the strategy; it is obviously related to the priorities established by the policymakers in conjunction with outside information sources and upper levels of transit management.

Next comes the step of developing a marketing plan. This will include thoughts about the segments of the market to be pursued. A key decision has to be made as to whether or not the transit property will seek to serve only captive riders or will seek to serve a much more general public. The types of service, the structure of the system, and the kinds of management activities will vary according to these different goals. The type of transit product (that is, the nature of the service) should be considered here, along with the pricing schemes and promotional plans that will be used to market different types of transit service to the various segments of the urban travel market that will be pursued.

The next step is to determine the facilities, equipment, organizational resources--and, perhaps, the political or legislative requirements--needed to achieve the objectives and serve the target markets. The selection of what is to be done and the sequence of the actions is the strategic plan.

Turning Strategy into a Financial Plan

Turning a strategy into a financial plan is the next step. (See Figure 1.2) There are many questions that have to be raised, such as what are the long-range financial implications of the plan, what has to be done to implement the plan that may require additional resources, and finally, the determination of whether or not there is a need for legislation, referenda, additional planning, or other measures. In moving from the strategic plan to the financial plan, the planners need to focus on the financial impact of the programs that will be undertaken. An obvious step here is a review of the ongoing programs, including the present operations and the cost of those operations pro-

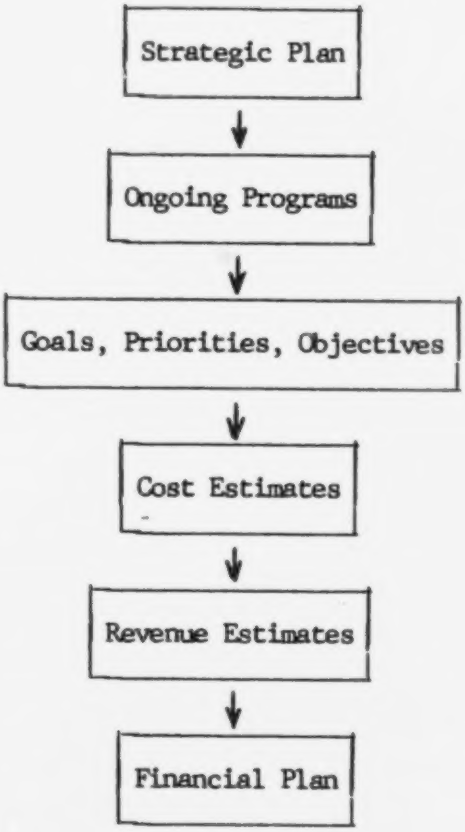

Strategic Plan
Ongoing Programs
Goals, Priorities, Objectives
Cost Estimates
Revenue Estimates
Financial Plan

FIGURE 1.2 Financial planning.

jected into the future for the next year or two. Routine capital replacement costs are also part of the financial planning process. The horizon time span is no set term of years. It is as far out into the future as one may expect a transit property or the community it serves to stay generally the same, with no transit capital undertakings of large magnitude or cataclysmic changes in the urban place itself.

Considering new programs in keeping with the overall strategy, the financial planners now decide what needs to done. The new programs would, of course, be based on the short term goals and priorities for the next few fiscal years of the property, and should be based most closely on the objectives established for the new undertakings. As one moves from the strategic plan to the financial plan, the financial planners must determine whether or not funding levels are realistic, based on the best estimate of what may be available. The ongoing and new program elements of the financial plan should be coordinated by a formal programming system in which the various tasks to be achieved, and their costs and budgets are laid out carefully along with a timetable for the expenditures.

Operating, maintenance, and capital cost estimates are the next step. Estimating costs is never easy; for example, financial planners will have to forecast labor costs. This is usually done by the use of trends, including the agreements in the labor contract that must be honored throughout the life of the contract. Certain assumptions about productivity of labor have to be made at this point. In making this judgment, financial planners need to know the status of pay and work conditions in the transit industry generally and the impact that the industry conditions elsewhere may have on local rates of pay and conditions of future contracts.

The organization of the transit property and its personnel should be considered along with plans for any necessary changes in the number or type of personnel and the way the property is organized. For example, if the strategic plan foresees the construction of several additional storage and maintenance facilities to service different divisions of an expanding transit service, personnel costs will change because planners, construction engineers, and other personnel will be needed.

Forecasting maintenance cost is usually accomplished by trend analysis. Some transit properties have done an excellent job of costing out maintenance; others have very limited information available. The more information that is available, the better job financial planners can do. Consideration should be given to new maintenance procedures, new equipment, or new facilities coming on line that may increase the productivity in maintenance, or decrease it in the case of new, more complicated equipment. If good information is available, it may be possible to make certain assumptions about productivity in the maintenance realm; for example, improved maintenance management practices may lead to an increase in productivity. Also useful are standard costs for certain kinds of routine maintenance jobs--such as changing bus brake linings.

Energy costs now are a major element of the cost of transit operations, whether electricity or petroleum-based fuels are used for power. Diesel fuel cost estimates are usually based on past trends and the state of the world economy as it affects crude oil prices. Because oil prices are related to the world political and economic situation, world affairs need to be monitored. Electrically powered systems must assess the possible trend of rates with the local power company and the potential impact that careful negotiation might have on rate trends.

Estimating capital cost reflects two elements. The first is the need to modernize and sustain the existing plant and equipment based on a routine capital replacement plan. This should be relatively straightforward and not difficult to estimate. The need to improve and expand the level of service, however, involves a decision that has to be based upon the timing and the extent of investments. Needed input here is the projected demand for transit over the period of the strategic plan and the capacity of the existing system to meet that demand. From this information, the strategic plan would lay out certain activities and efforts of a capital nature and the financial planners would need to know and understand the impact on capital expenditures and the timing of those expenditures.

In estimating revenues, there is a need to forecast the number of passengers. The average fare paid is also a necessary part of the information. With the cooperation of the service planning department (if there is one), an estimate of the number of passengers in the current year and years in the future has to be made. Adjustments also have to be made for the patterns of demand related to changes and fares. Perhaps more difficult is forecasting the subsidies flowing to transit over a protracted period of time. The federal subsidies are based on appropriations as well as authorizations for the different programs. The program to be supported and the amount of money therefore is something which does not have a known life; the subsequent authorizations, or lack thereof, and budget appropriations, or lack thereof, are a matter of conjecture.

Nonfederal government subsidies can be forecasted using a number of approaches including: trend analysis, economic modeling, accounting identifiers, expert judgement, and mathematical routines. Most transit properties hire consultants to forecast these revenues because this requires a very specific type of expertise. The quality of the forecasting is strictly dependent upon the management information system developed by the transit property. The always difficult, but essential decision relative to a management information system is to consider what information to collect, and not to collect too much or too little. Equally important is the desire and will to use the information collected.

The financial planning process also requires some formal iterative procedure of regularly matching revenues and costs. As might be expected, this is a tricky, speculative undertaking, especially when projecting far into the future. The best suggestion is the use of scenario planning with each scenario based on different assumptions about such key factors as ridership, federal support, new taxes, fare changes, labor costs, inflation rates, and so on. A convenient way to handle this is with a spread sheet on a microcomputer so that various combinations of factors can be tried and examples carried out much faster than could be done by hand. Such planning is vital because it provides a variety of options for the policy board to consider and to compare and assess the impact of a variety of factors over the next five to ten years, or whatever the appropriate time horizon may be. The various scenarios should, or course, be reasonable; windfalls and total disasters, or any extreme speculations should be avoided. The board must choose the scenario it feels is most likely or preferable; from this choice there is a resulting set of financial assumptions, implications, and decisions to be made.

Budgeting

The budget process turns the ideas and desires of the financial plan into a more concrete annual plan. Budgeting for a transit property--or any enterprise--is annualized, detailed planning of the implementation of key decisions that are laid out in the financial plan. The purposes of the budget are rather clear cut. First of all, the budget is an aid in making and coordinating short-range plans. It is also a succinct device for communicating plans to the managers of specific activity centers and acts as a potent, quantitative means of motivating managers to achieve established budget targets. A budget is also a benchmark for controlling ongoing activities and the basis for monitoring centers of financial responsibility and their managers for performance and achievement of objectives. Perhaps the budget can best be seen as a means of educating managers to the process of managing because it helps weave together the fiscal aspects of a property's activities.

There are several budget components. The operating budget reveals the planning operations for the coming year and it includes the expected revenues and expenses. One way of doing this chore is through use of a program budget. A program budget shows the estimated revenues and costs of the major programs of the transit property, arranged by department or service with the revenues and costs of each spelled out. Another means of preparing an operating budget is by use of a responsibility center budget; in these the plans are set out in terms of the responsibility centers. Responsibility center budgets are most often used in construction and are usually broken into cost elements such as labor, materials, fuel, etc.

In preparing the operating budget, a budget committee is useful. This committee, separate from the policy board budget committee mentioned earlier, is usually guided by a budget director and is a top management group that recommends the budget guidelines that the organization is to follow for the budget period. The budget committee also coordinates the separate budgets prepared by the various organizational units, helps to resolve any differences that may exist between the units, and, finally submits the final budget to top management for its perusal, and, perhaps after some modifications, for its approval.

The budget staff may do most of the budget work in any organization. Nevertheless, the most crucial budgeting is really done by the various segments of the line organization; they should play a key role in helping to establish objectives for the transit property and also in deciding what financial resources will be needed in order to achieve those objectives. Bottom-up budgeting is the jargon often used to describe the procedure, and the process wisely lets those closest to the action set their budgets. This procedure is quite useful in setting not only the total amount in the budget, but the pace of the expenditure.

There are many tricky questions concerning the relationship and interaction between the budget committee, the finance director, the general manager, the finance committee of the board of directors, and the board as a whole. Whatever differences and problems there are should be solved as quickly as possible and as early as possible so that the budgeting process, as well as the whole financial planning and strategic planning process, can move along smoothly.

In terms of timetable, the budget is usually developed on an annual basis. In some cases, monthly information is provided. What this means is that the annual budget is broken down into monthly periods in order to provide benchmarks; the budgeting process is not carried out separately for each month. Another common practice is to prepare quarterly budgets for a year, with regular updates. This latter procedure is particularly appropriate where the situation is volatile or where close control is desired.

In an uncertain world, it is probably a wise idea to do regular rebudgeting within the fiscal year framework in order to take account of any unexpected changes that may occur. This process is becoming somewhat easier because the use of electronic data processing has made information available on a more timely basis today than was possible in the past. In the best situation, adherence to the overall budget should be monitored on a monthly basis as well as on a departmental or other organizational unit level.

In addition to an operating budget, a revenue or sales budget may also be prepared. This is a statistical forecast based on a mathematical analysis of general conditions in the economy, the market conditions locally, tax draw downs for the transit property, and receipts of grants from federal, state and local government. It is also a concoction that includes judgmental estimates as a cure for the problem of uncertainty, and reflects negotiation between top management and underlying management on just what the revenues will be.

Another type of budget is the cash budget, which shows revenues and expenses and cash inflows and outflows. The latter is the main concern in the timing of certain expenditures. The cash budget begins as a budgeted balance sheet and income statement; it is adjusted to reflect the planned sources and uses of cash over the relevant time period. It is very important to use this in analyzing plans having cash flow implications in order to estimate each of the sources and uses of cash. No transit property or other enterprise wants to be embarrased, or perhaps cast into serious fiscal difficulties, by not having sufficient cash at hand when it is needed. Grant reimbursement procedures from various levels of government may be bound in red tape or just plain delay, often leading to cash flow problems for a property.

The capital expenditures budget is usually prepared separately from the operating budget. The capital budget lists the expenditures for capital to be made in a given time period. Generally, the wisest course is to segregate out capital replenishment projects or replacements of equipment--such as new buses for old--from the budgets for completely new capital investments.

Problems and Pitfalls

There are a number of problems and pitfalls having to do with the financial world of transit that should be included in any discussion of financial planning: expansion of the service area, inflation-sensitive financing, predicting fares and elasticity of demand, and ability to control costs.

Many transit properties in recent years have been involved with expanding the tax base by expanding the service area; that is, transit properties have moved from serving principally a major civil city jurisdiction to providing service on a county wide or multiple-county basis; the allure is not only the sense of serving the whole of a metropolitan area, but a larger tax base. Such territorial expansions have been popular notions for years and have been especially tempting in these times when federal aid is uncertain. The problem is that service may have to be so greatly expanded to touch the whole of the jurisdiction of the subventions, that the increased tax and farebox revenues from the expansion of service will be far outrun by the expanded costs. In such a circumstance, expanding the service and tax base becomes self-defeating from a financial viewpoint. It is hard to predict, but experience shows that the transit properties should be wary about substantial increases in the service and tax area. Little good is achieved if a larger number of dollars is being spread more thinly than before.

With the need to depend upon state and local fiscal sources on an increasing basis, there is a natural desire to find some source that keeps up with inflation. Looking at the spectrum of assistance possible, property tax is not only sluggish, but it is also highly unpopular. It may be the single largest tax means of supporting transit, but property tax has some real problems. It may not rise fast enough to be useful in times of inflation or rising costs and increasing the rate of taxes may require a referendum. It also requires that assessment values be reassessed on a frequent basis to stay up with changing property values. Reassessment is not popular and in many places it is not done with sufficient frequency.

A sales tax is more reflective of the state of the economy and inflation and is attractive because as prices go up, the sales tax revenues go up. However, it is usually considered to be highly regressive toward low income persons. Even so, a sales tax may be justified on the degree of relative benefit various groups receive. If the poor benefit more from transit, there may be nothing wrong with their paying a larger proportion of their income for transit support. To reduce conflict over the regressive nature of sales taxes, such basic items as food and medicine may be exempted from the sales tax; or a piggyback on a local sales tax for transit--an extra half cent, perhaps--may not include such things as food or medicine.

The income tax is attractive because it reflects the ability of persons to pay. This raises some difficult questions, however. Should all residents or all workers in the transit authority area pay the income tax? Moreover, those who pay the most income tax for transit may use transit the least and they may, with some justification, question that equity. Also, one must be aware that the income tax is highly linked to the general condition of the economy and the level of employment. This is probably not a good source of tax revenue for downside situations.

Of course, no tax is safe and sure and since no one tax source is safe from ups and downs, probably a spectrum of local taxes is best. With a variety of taxes, the likelihood of instability of financial resources is apt to be diminished. It should be noted, however, that any effort that requires a referendum in order to get passed imposes yet another level of difficulty on management. It also forces management into the political arena because there is no way to avoid politics in trying to develop a positive referendum situation for transit.

Another problem arises with predicting fare receipts. Many transit properties have poor information available, and one must find out whether or not there is good detailed passenger data available. Does transit management know who rides and who pays and what they pay? How many classes of fare are there to dilute the base fare and exactly what is the average fare? The average fare calculation should be made on a regular basis because it is highly important in trying to predict the yield from various changes in passenger demand. Sampling should be performed regularly to determine as accurately as possible what the average fare that is being paid really is.

One of the harder things to estimate is the elasticity of demand in regard to fare changes. In some cases, a rise in fares has rather clearly cut patronage; in other cases, it has had no observable impact. Probably the worst situation is to raise fares and cut service at the same time, which is sure to alienate many present and potential riders. Another question to ask and answer is whether or not there are riders who will pay a high fare because the service is good, such as for express service. These are passengers to covet because of their potential contribution to revenues. Is sufficient promotional effort aimed at these people in order to encourage their participation and payment? Another question is what promotional effort is being used to boost patronage and is there any information on the impact of the promotional effort? Is the transit agency capable of contracting to provide special services in order to boost its revenues? All of these factors come to bear and make predicting fare receipts very difficult, especially over an extended time horizon.

There are serious questions about the transit property being able to control its costs successfully, either because of uncertain cost estimates or a lack of cost information. On the other hand, do the costs control it? Is the concern about costs the major driving force on the system or are there broader, more cogent concerns? While costs and control of costs is important, it is not the sole reason transit service exists nor the singular justification of the presence of a management team. The amount and degree of detail in the cost information is important in any effort to manage the transit property. Are the costs broken down sufficiently so that management can take intelligent action? In labor costs, for example, are pull-out, pull-in, overtime, relief time, and report time calculated separately or are they all lumped together just as labor costs? Are there cost calculations per route; does anyone really know what it costs to operate a given route or a given trip on a given route? If only average costs are available, management is in trouble because it is difficult to manage on the basis of average costs. In many cases, a dangerous situation exists where costs are merely projected up and down without adjustments being made for inflation or the ability to control certain cost elements.

In the maintenance area, costs are often not carefully or accurately estimated nor is detailed information kept. For example, are there vehicle histories with detailed costs so that the maintenance manager can understand the weaknesses and the strengths of given types of equipment or parts and therefore know what to order to do a job in the future? Are there standard costs per job? Many transit properties have no idea what a job should cost and therefore have no guideline for the effort. Another difficulty is the importance and percentage of automatically escalating costs, such as the cost-of-living allowances and health insurance premiums. These are major cost elements in transit in recent years and therefore warrant strict attention.

Summary

It should be noted once more that the orderly financial planning process discussed here is rarely used in the transit industry. Most transit properties have no strategic plan, no goals or objectives, and therefore have no idea what it is they are trying to do over more than the very shortest run situation. Lack of interest on the part of the policymaking board is one reason that little or nothing may be done in either strategic or financial planning. This may be due to amateurism on the part of the board (a notorious malady of public boards), or the kind of short-run thinking that permeates the political atmosphere, and transit, as a public enterprise, is inescapably in the political arena. Management may lack the professionalism to give thought to the processes of strategic or financial planning. Moreover, the transit industry has no tradition of the kind of long-run thinking that is needed for the efforts discussed in these pages. Even where policymakers and management wish to do long-range strategic and financial planning, a lack of staff (and most transit properties are understaffed) and a shortage of good information, may doom the effort from the start.

Whatever the reason, most transit properties have reduced financial planning to nothing more than the annual budget preparation. Moreover, for many transit agencies, the lack of careful planning and poor information has made supplemental budgets necessary each year. Lamentably, transit properties without any kind of strategic planning or financial planning have foregone the opportunity to take advantage of the process of giving careful thought to the future and helping to shape that future. Most transit properties are, in essence, merely bystanders to the oncoming facts of the future and, inescapably, cast in the role of victims and reactors to what lies ahead.

In summary, the financial plan is derived from the strategic plan and the strategic plan is long-run in nature. Therefore, financial planning is not just for the immediate future but also for the longer-run future. From the strategic plan, goals, priorities, and objectives are derived and agreed upon by the policymaking board and top levels of management. The financial plan, then, is based on the establishment goals, objectives, and the established priorities.

From the financial plan, the budget is prepared. The budget is a detailed annual financial plan. All of the elements--which include the strategic plan, the goals, the priorities, and the objectives--should be reviewed on a regular basis. Likewise, the financial plan and the budget should be regularly reviewed.

CHAPTER TWO

ACCOUNTING FUNDAMENTALS

Introduction

A basic understanding of the accounting system is essential for making good financial decisions. An accounting system provides a means of collecting data on the financial activities of a firm and for organizing that data in such a way as to provide useful information. This information can be used for internal planning such as calculating the financial impact to a transit system of planned service changes. Information obtained through the accounting process is also made available to interested parties outside the transit system, such as governmental agencies that require certain information as part of various assistance programs.

Accounting Process

An accounting system is intended to record the financial transactions of an organization. A transaction represents an exchange (or some other change) pertaining to the financial activities of an organization. These transactions are initially recorded in a journal. A journal is a chronological record of the business transactions of an organization. In order to provide useful information the journal entries need to be classified and summarized. Transactions of a similar nature are grouped into an account. For example, there may be one account for cash, another for wages payable, etc. The number and type of accounts depend upon the information requirements of the transit system. Section 15 accounting and reporting requirements establish standard codes for all revenue and expense transactions in a transit system. All of an organization's accounts are collectively called the general ledger. Data from the various accounts are summarized and presented in financial statements. These financial statements are the focus of financial planning.

The Accounting Equation

The accounting equation which is the basis of all accounting practice is:

Assets = Liabilities + Equities

Accounts can be grouped into several types. Asset accounts represent economic resources that can be used to provide future benefits to the organization. Liabilities are the financial obligations of the organization which are owed to its creditors. Equities are the claims of the owner of the firm to the assets, after the creditors' claims have been satisfied. A revenue account represents the proceeds from the sale of a good or the provision of a service. An expense account represents the consumption of a resource to produce that good or provide the service.

The Double Entry System

Financial transactions are recorded in the accounting records using a double entry system in which each transaction affects at least two accounts. At least one account is debited and at least one other account is credited in every transaction. A debit is used to record:

Increases In	Decreases In
Asset accounts	Liability accounts
Expense accounts	Equity accounts
	Revenue accounts

A credit is used to record:

Increases In	Decreases In
Liability accounts	Asset accounts
Equity accounts	Expense accounts
Revenue accounts	

Regardless of the number of accounts involved in any transaction, the total dollar amount of the debits must always equal the total dollar amount of the credits. Normally asset and expense accounts will have debit balances. Credit balances are the normal status for liability, equity, and revenue accounts. Another important equation for all accounting practice is:

$$\text{Debits} = \text{Credits}$$

T-Accounts

A helpful way of viewing this double entry process is through the use of a "T-Account." Entries made on the left-hand side are the debits, while entries made on the right-hand side of the "T" are the credits. It should be noted that account forms used in actual practice do not look like a T-Account. The following example consisting of two transactions will help illustrate the use of a journal and T-accounts.

Metropolitan Transit Corporation (MTC) currently has $1,000 in cash, a $600 purchase on account for parts from Acme Bus Supply listed under accounts payable, and a $100 account receivable from the Metro Independent School District for services rendered earlier in the month. The T-accounts and balances are shown below.

Dr.	Cr.	Dr.	Cr.	Dr.	Cr.
Cash (Asset)		Accounts Payable (Liability)		Accounts Receivable (Asset)	
Bal $1000			Bal $600	Bal $100	

MTC makes the following transactions:

a. MTC pays Acme the due cost of $600 cash.
b. A few days later, the Metro Independent School District pays MTC $100 for services provided.

The journal entries for the two transactions are:

	Dr.	Cr.
a. Accounts payable	600	
Cash		600
b. Cash	100	
Accounts receivable		100

The transactions would be entered into the T-accounts as follows:

Dr.	Cr.	Dr.	Cr.	Dr.	Cr.
Cash		Accounts Payable		Accounts Receivable	
1000			600	100	
	a.600	a.600			b.100
b.100					
Bal $500			Bal 0	Bal 0	

In the first transaction (labeled "a") $600 in cash is going out (a credit to the cash account) to pay what is owed to Acme. By making this payment, the corresponding debit to accounts payable reduces that account balance to zero. In the second transaction (labeled "b"). MTC receives the $100 owed to it by the Metro Independent School District. The debit to the cash account is for the incoming cash while the credit to the accounts receivable account reduces the balance to zero. The balance of the cash account is now $500.

Financial Statements

The accounting process permits the collection and classification of data pertaining to the financial transactions of the organization. The various financial statements are produced from this data.

There are two main types of financial statements: those which reveal the financial status of an organization at a particular point in time, and those which summarize the organization's financial activities over some period of time. A financial statement of the first type is the balance sheet. The income statement is of the second type. As most transit systems are publicly owned not-for-profit organizations, the title "Statement of Revenue, Expense, and Assistance" may be used in place of "Income Statement". Figure 2.1 represents the relationships between the balance sheet and the income statement. (See Chapter Seven for more discussion of Balance Sheets and Income Statements.)

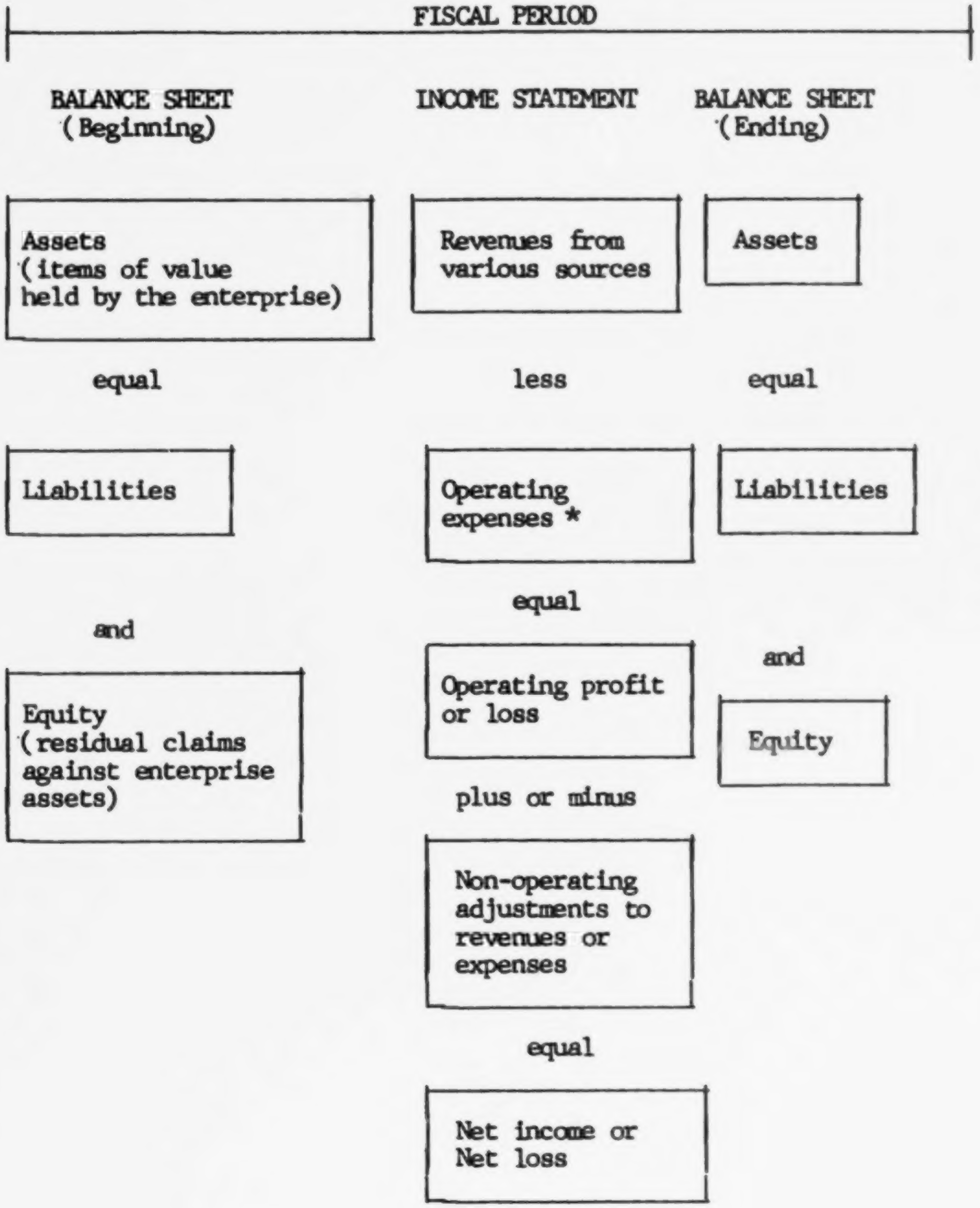
The Balance Sheet

As stated previously the balance sheet provides the financial status of the organization at a particular point in time. Figure 2.2 shows a balance sheet. The main catagories of items on the balance sheet are assets, liabilities, and equities. (Recall the accounting equation: Assets = Liabilities + Equities.)

Assets. Assets are economic resources that can provide potential future benefits to an organization. Assets are broadly divided into current assets and property, plant, and equipment. Current assets represent such resources as cash, receivables and supplies; these are items which are expected to be consumed or converted to cash within one year. The property, plant, and equipment catagory refers to relatively long-lived assets which are used in the production of a good or the performance of a service, such as the transit vehicles owned by a transit system.

A distinction is sometimes made to specifically identify those current assets whose use is limited to certain purposes (such as for aquisition of fixed assets which are on order). The use of a restricted assets section on the balance sheet would accomplish this notification objective.

Liabilities. Liabilities are financial obligations of the organization that will result in the probable future sacrifice of economic benefits. Liabilities can also be classified as either current or long term. Current liabilities are obligations which will come due (require


FISCAL PERIOD
BALANCE SHEET (Beginning)
INCOME STATEMENT
BALANCE SHEET (Ending)
Assets (items of value held by the enterprise)
equal
Liabilities
and
Equity (residual claims against enterprise assets)
Revenues from various sources
less
Operating expenses *
equal
Operating profit or loss
plus or minus
Non-operating adjustments to revenues or expenses
equal
Net income or Net loss
Assets
equal
Liabilities
and
Equity

* Operating expenses may be attributable to the generation of specific revenue items that are recognized, may be unallocated period costs, or may reflect depreciation charges against long-lived assets.

FIGURE 2.1 Relationship between the balance sheet and income statement.

Metropolitan Transit Corporation
Balance Sheet
As of January 1, 1985

Assets	Liabilities
Cash	Accounts/notes payable
Marketable securities	Taxes payable
	Advances
Accounts/notes receivable	
	Accrued expenses
Inventory	Mortgages
Prepaid expenses	Bonds
Land	Capital lease obligations
Building	**Fund Equity**
Equipment	Capital grants
Accumulated depreciation	Retained earnings
Leaseholds	

FIGURE 2.2 Balance sheet.

payment) within one year. Examples of current liabilities include accounts payable (for monies owed to suppliers) and accrued wages (for monies owed to employees). Long-term liabilities are those obligations which are due at some latter point in time, such as general obligation bonds which must be retired in five years.

Equities. Equities represent the other claims on an organization's assets once the claims by creditors (in the form of liabilities) have been met. In privately owned firms this is the owner's or stockholder's equity. Examples of stockholders' equity accounts are preferred stock, common stock, and retained earnings. As most transit systems are publicly owned, there are no stockholders. The term fund equity is generally used rather than owner's equity for publicly owned, not-for-profit organizations. Fund equity accounts describe the source of capital grants (federal, state, or local).

The Income Statement

The Income Statement (or Statement of Revenue, Expense, and Assistance) summarizes the financial activity of an organization over some period of time (e.g., one month, one quarter, or one year). An example of a Statement of Revenue, Expense, and Assistance is presented in Figure 2.3. This financial statement is concerned with revenues and expenses. Revenues are inflows to the organization received in exchange for the services it renders. Passenger fares are an example of revenue. Expenses represent the outflow or costs incurred to provide the services. Examples of expenses include employee wages and tire rental payments. The financial assistance that is received by a transit property is also shown this financial statement.

Statement of Changes in Financial Position

A third financial statement that is of use to a financial manager is the Statement of Changes in Financial Position (or the Sources and Uses of Funds Statement). This statement is esential because it shows the principal sources and uses of capital flowing through the organization at a particular time, or in other words it aids in assessing the changes in a organization's liquidity, and structures of the organization's assets and equities. Liquidity is viewed as an indicator of how easily and quickly a noncash asset can be converted into cash.

Sources of Funds	Uses of Funds
Decrease in an asset category:	Increase in an asset category:
- Reduced cash, accounts receivable, or inventory	- Expanded cash, accounts receivable, or inventory
- Sale of physical capacity	- Addition to physical capacity

Sources of Funds (cont.)	Uses of Funds (Cont.)
Increase in a liability category:	Decrease in a liability category:
- Expanded accounts payable	- Repayment of accounts payable or debt obligations
- Increase in short or long-term borrowings	
Increase in equity category:	Decrease in equity category:
- Capital grants	- Results of unprofitable operations
- Results of profitable operations	

Total Sources = Total Uses

Working Capital

Related to the notion of sources and uses of funds is the idea of working capital. Net working capital, usually called working capital, is the difference between current assets and current liabilities. Working capital gives the financial manager a picture of the excess of current assets over the claims to those assets. This is important because as business activities increase in a firm due to expansion, there is an increased need for working capital (for inventory, accounts receivable etc.). Hence eventually both sources and uses of funds must be identified in advance so that financial managers will know how much additional capital will be needed to continue normal operations, and can subsequently plan for obtaining the needed capital.

Cost Analysis

The accounting system provides the necessary information to be used for financial planning. Such planning or analysis also requires an understanding of different cost behaviors. Within a given length of time certain costs are said to be fixed while others are considered to be variable. Fixed costs are those which will be incurred in the short run regardless of the volume of output. Over a longer period of time it is possible to change a fixed cost (increase/decrease capacity). It is the behavior of the different types of costs during the short run that we are concerned with. For a given level of capacity (fixed cost), we are concerned with how different levels of output affect the amount of the variable costs which are incurred and the size of the operating surplus or deficit which results. (See Figure 2.4.)

Variable Costs

Costs that change in direct proportion to changes in the level of activity or output are called variable costs. Examples of these costs are the wages for vehicle operators and the fuel involved in the operation of the transit system.

Metropolitan Transit Corporation
Statement of Revenue, Expense and Assistance
For year ending
December 31, 1985

Revenues:

- Passenger fares
- Charter service
- Advertising
- Interest

Total revenue

Less expenses:

- Transportation
- Maintenance of equipment
- Administrative and general
- Payroll taxes

Total expenses

Loss before local and federal assistance

Local and federal assistance

Net loss

FIGURE 2.3 Statement of revenue, expense, and assistance (or income statement).

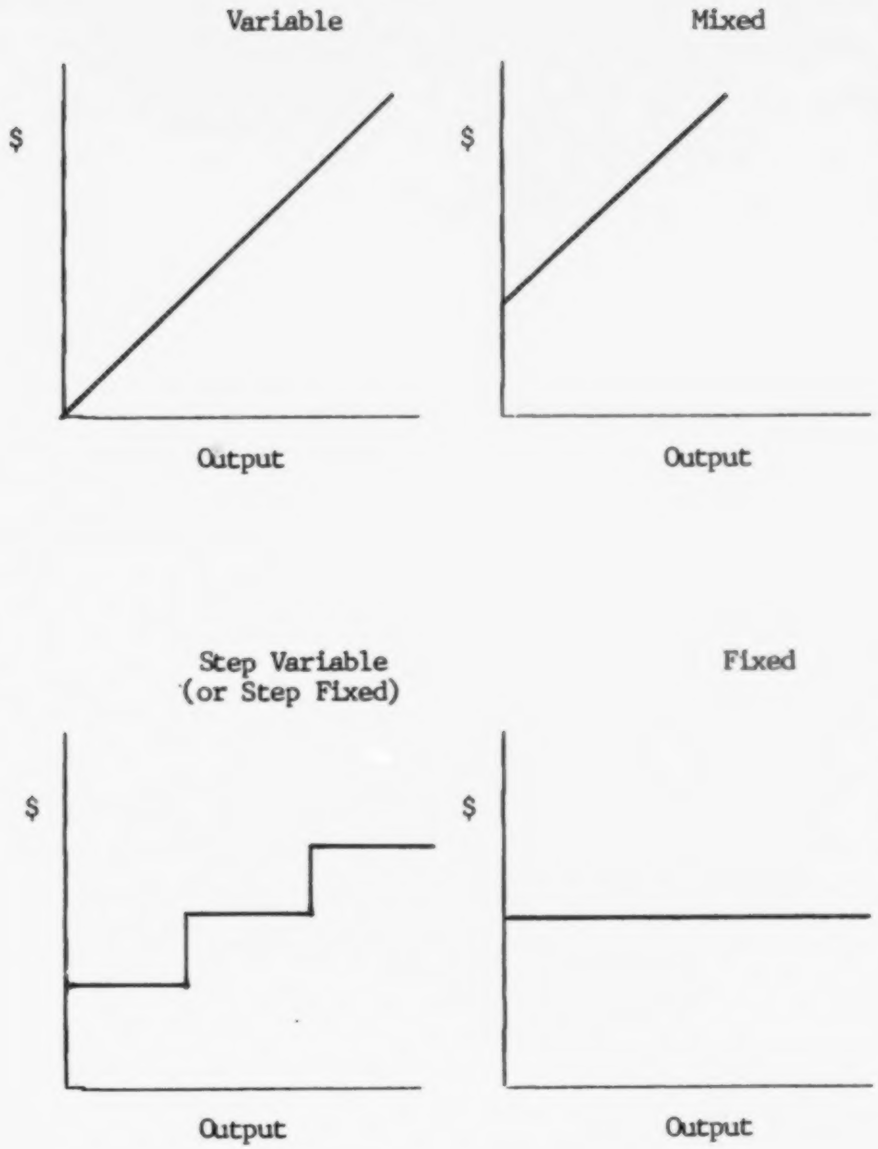


FIGURE 2.4 Cost Behaviors

Fixed Costs

Fixed costs are those costs that remain constant in the short run regardless of the level of output or activity; they are often called unavoidable costs. Examples of fixed costs are rent, property taxes, and salaries of managerial and administrative personnel.

Mixed Costs

Other types of costs represent combinations of the variable cost and fixed cost behaviors. A mixed cost is one which has a minimum fixed cost (usually associated with the passage of time) and a variable cost associated with its use. An example of a mixed cost would involve a transit vehicle in the reserve fleet. A certain amount of maintenance is required to keep the bus in operating condition, even if it is not used during that period of time. This is the fixed cost component of the mixed cost. If the vehicle is placed into active service then the usual variable costs (fuel, tires, etc.) will be incurred for the operation of that vehicle.

Step Variable Costs

A step variable cost (or step fixed cost) is one in which the cost remains constant within a certain range of output. This cost behavior can be best visualized in terms of a set of stairs. An example of a step variable cost might be the use of street supervisors. One supervisor may be able to monitor up to six vehicles. If additional vehicles are being operated another street supervisor is required. Thus in going from six vehicles to seven vehicles the supervisory cost would "jump up" as a second supervisor would be required. Once you have added a second supervisor this cost would not change if there were eight or nine or even 12 buses to monitor. At 13 vehicles, the supervisory cost would again "jump up" because a third supervisor would be needed.

Break-even Analysis

The break-even point is that level of output or activity where total revenue received equals the total costs. At this point, the organization has neither made nor lost money, but all costs for the period will be covered. Revenue above the break-even point will generate an operating surplus while revenue below this point will result in an operating loss. Even though transit systems don't cover all of their expenses through passenger fares (and therefore fail to break even or make a profit), break-even analysis is still a valuable tool. Operating assistance from federal, state, and local governments can be considered as revenue and therefore the systems should still use breaking even as a goal. Break-even analysis can also be used to compare and examine the performance of individual routes within a system, some of which can actually make a profit.

Figure 2.5 shows a graphical representation of the break-even concept. It should be noted that a given break-even chart is relevent only within the range in which its fixed costs do not change.

A break-even analysis can also be performed mathematically. As stated previously, the break-even point occurs at the volume where:

$$\text{Revenue} = \text{Fixed Cost} + \text{Variable Cost}$$

$$\text{Number of Passengers} \times \text{Fare per Passengers} = \text{Fixed cost} + \text{Number of Passengers} \times \text{Variable cost per Passenger}$$

The terms can be rearranged algebraically to provide the equation:

$$\text{Break-even number of passengers} = \frac{\text{Fixed cost}}{\text{Fare per passenger} - \text{Variable cost per passenger}}$$

Break-even analysis has a number of uses as planning tool. It illustrates the relationship of varying levels of output and operating surplus or loss. It allows a transit manager to calculate what level of service a route will require to break-even. Break-even analysis will also allow a manager to determine the level of assistance that a service will require if less than the break-even number of passengers are attracted.

An example of each method will help to demonstrate the techniques. The data for both examples is:

$F = \text{Fixed costs} = \$500$

$V = \text{Variable cost per passenger} = 25¢$

$P = \text{Fare per passenger} = 75¢$

$X = \text{Volume of output} = ?$

The equation $F + V(X) = P(X)$ can be used to find the break-even point. Using simple algebra this equation can be rearranged as:

$$X = \frac{F}{P - V}$$

$$= \frac{\$500}{75¢ - 25¢}$$

$$= 1{,}000 \text{ passengers}$$

The graphic display of this process can be seen in Figure 2.5. The area above the cost line, below the revenue line, and to the right of

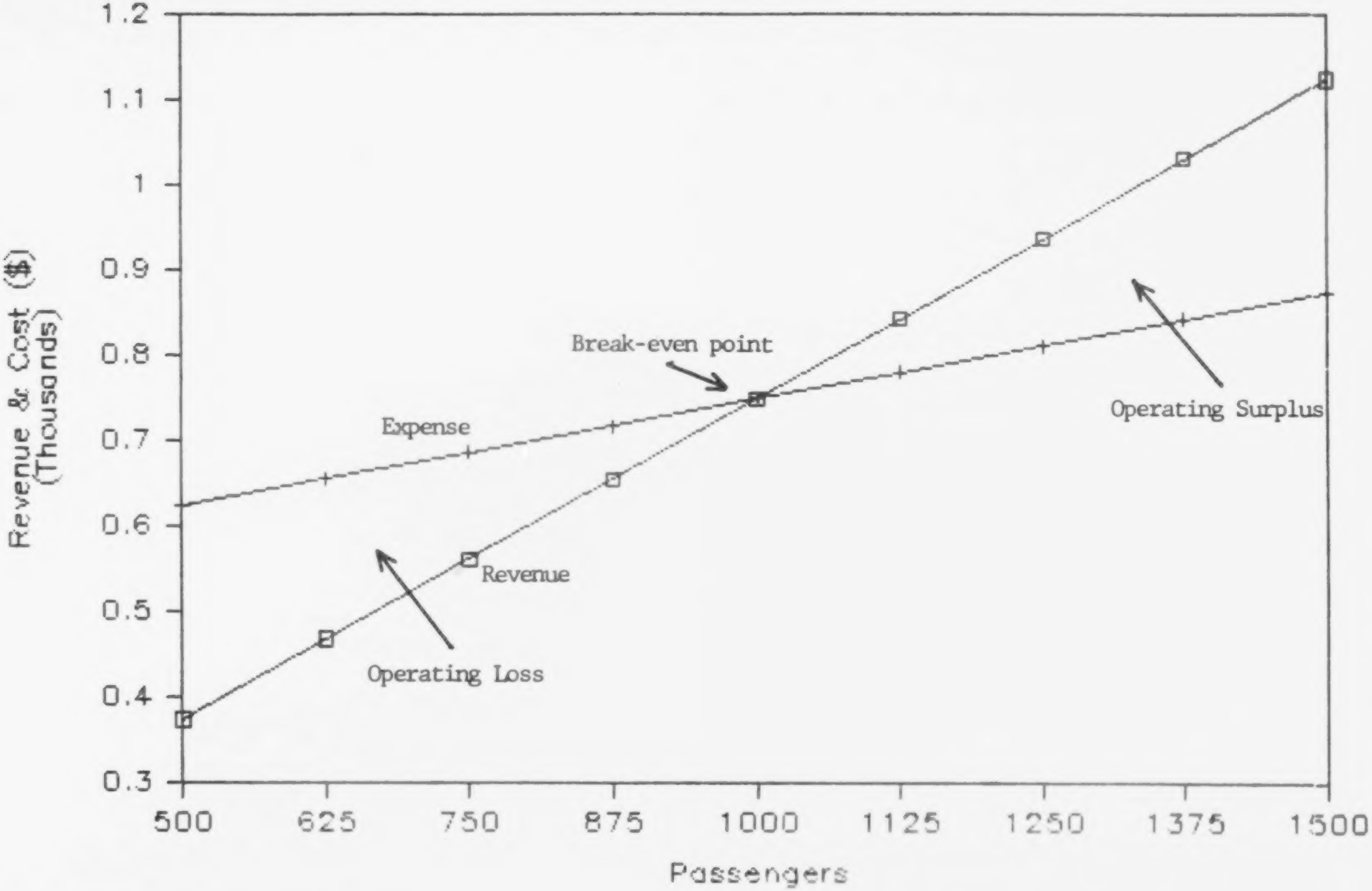


FIGURE 2.5 Break-even analysis

the break even point represents surplus revenue if ridership on that route can be increased beyond the break-even point.

Cash and Accrual Basis of Accounting

Differences

There are two basic methods of accounting: cash and accrual. Under the cash basis of accounting, revenues and expenses are not recorded until cash is received or paid out. Thus, a sale made on account is recognized and recorded only when the payment is received from the customer. Similarly, if supplies are purchased on credit with payment due in 30 days, the expense would be recognized and recorded upon payment to the supplier.

The accrual basis of accounting recognizes revenues as occuring when a sale is made (or a service rendered), regardless of whether or not cash was received at that time. Expenses are recognized when incurred, even though cash may not be paid out then. Accrual accounting attempts to match revenues and their associated expenses.

A key distinction between the two methods is revealed in the financial statements produced under each method. Assume that a sale is made on account on December 31, 1985. Cash is collected from the customer on January 30, 1986. Under the accrual basis the revenues would be attributed to the year ending December 31, 1985, because this was the period during which the sale was made. The cash basis of accounting would show the revenues as attributable to the year 1986 since that is when the cash was received. In a similar fashion, assume that an expense was incurred in the year 1985 and paid in year 1986. The cash basis of accounting would show the expense in the 1986 financial statements. The accrual basis would attribute the expense to 1985 and show the expense accordingly in that year's financial statements.

Cash basis accounting systems tend to be simpler to operate than accrual basis accounting systems. The latter are more complex, as a variety of transactions, not just those involving cash, must be recognized and recorded. Thus, there are more transactions to keep track of and more data to collect and maintain. It is generally felt that the accrual basis of accounting presents a more accurate financial picture of an organization.

The cash basis of accounting is considered generally acceptable only when the results that it produces are similar to those which would have been obtained under the accrual basis. This might be the case for firms which operate largely on a cash-for-sales basis. Public transportation has been considered such an industry due to its historical reliance on the farebox (coin) to generate the bulk of its revenues. Thus the cash basis of accounting suited the needs of private transit operators fairly well. As the transit industry moved toward public ownership, other sources of revenue replaced the farebox's dominant position. These other sources tend to be in the form of periodic payments from various governmental units. Normally there is a delay between performing the service (incurring the expense) and receiving non-farebox revenues for performing that service (an operating grant).

Section 15 (Uniform System of Accounts and Records and Reporting System) requires that all reports prepared to meet its requirements use the accrual basis of accounting. Transit properties not using the accrual basis may continue to use their existing accounting system, but must adjust their data to meet the accrual accounting system reporting requirement.

Cash Versus Accrual Accounting Example

An example will illustrate the difference between cash and accrual accounting systems. As discussed earlier in this chapter, the amounts in the left side column are debits while the amounts in the right column are credits.

On January 7, 1986 Towline Transit operated a special charter shuttle for a convention held downtown. The convention organizers had purchased ride tickets in advance, paying cash for them on December 21, 1985. This initial transaction would be recorded under each method as follows:

		Dr.	Cr.
	Cash Basis		
12-21-85	Cash	100	
	Charter revenue		100
	Accrual Basis		
12-21-85	Cash	100	
	Unearned charter fares		100

Under the cash basis, the purchase of the tickets would be considered revenue. However, no service was performed to earn this revenue. Thus under accrual accounting, the tickets purchased in advance are considered a liability.

On December 28, 1985, a special purchase of fuel on credit is made to operate the charter service. Since this transaction did not involve cash, no entry is made under the cash basis accounting method. The accrual method recognizes that a liability has been created.

		Dr.	Cr.
	Cash Basis		
12-28-85	No entry		
	Accrual Basis		

On the day of the convention, the tickets are used. The entries would be as follows:

		Dr.	Cr.
	Cash Basis		
1-7-86	No entry		
	Accrual Basis		
1-7-86	Unredeemed charter fares	100	
	Charter revenue		100

Once again, since this transaction did not involve cash, no entry is made under the cash basis of accounting method. Under the accrual basis, the performance of the service means that the money collected in advance can now be recognized as revenue.

Similarly the vehicle operator will eventually have to be paid for his/her time. At Towline Transit, all employees are paid on the first of the month for work performed during the preceeding month.

		Dr.	Cr.
	Cash Basis		
1-7-86	No entry		
	Accrual Basis		
1-7-86	Operator wages	60	
	Wages payable		60

Under cash accounting, there would be no entry since the operator is not actually paid until the start of the next month. The accrual method would record the incurrance of the wages expense and recognize the creation of a liability.

At the end of the pay period when the operator is paid, the entry would be:

		Dr.	Cr.
	Cash Basis		
2-1-86	Operator wages	60	
	Cash		60
	Accrual Basis		
2-1-86	Wages payable	60	
	Cash		60

At this point in time, the expense for the operator's wages would be recognized even though it had actually been incurred previously. Under the accrual method the liability for the operator's wages would be eliminated.

Depreciation

Depreciation accounting is the process of allocating the acquisition costs of a capital asset over the period of its estimated useful life. Another definition describes depreciation as an estimate of the amount of service potential of a capital asset that has expired in a given period. Vehicles, equipment, and buildings all have a finite lifespan. Depreciation accounting attempts to match the depreciable cost of such an asset to the revenues generated by the use of that asset. A transit bus may be expected to operate for 12 years. Good accounting practices require that some means be used to allocate the acquisition cost of that bus to each of the 12 years of revenue service that it provides.

Depreciation is commonly associated with use by the for-profit sector of private industry for income tax purposes. As most transit service is provided by not-for-profit organizations, the income tax implications of depreciation accounting are not relevant. However, depreciation expense should be recognized as part of the cost of providing transit service. If depreciation is not considered, then the transit property is understating its costs. Recognition is given to the operation and maintenance costs, but not to the capital costs of vehicles and buildings. Allocating the full acquisition cost of a capital asset in its year of purchase is not a solution, because it may result in wide fluctuations of expenses from year to year (unless an equal value of capital purchases are made each year).

It should be noted that under fund accounting systems, depreciation is not used. There are legitimate arguments that the use of depreciation accounting is not appropriate for publicly-owned transit systems. The replacement of vehicles and facilities is funded through capital grants which are unrelated to the operational expenses of the transit property so there is no need to depreciate a capital asset for income statement purposes. Further, it is not necessary to associate the expenditure of capital funds with the provision of specific services (matching the revenue generated by the asset).

There are two main causes of depreciation: (1) physical deterioration due to wear and tear, and (2) obsolescence due to technological advances. In the first case, the use of the asset contributes to its decline. A transit bus has a limited life in terms of time or miles operated. For the latter case, the introduction of a more fuel efficient vehicle may mean that an older (less-efficient) vehicle is now obsolete. A limitation on the usefulness of an asset by either of these causes will determine the useful life of the capital asset.

Estimating Depreciation

The process of developing a depreciation estimate normally involves three factors:

1. Cost.

2. Estimated useful life.

3. Estimated salvage value.

The cost of the asset is its acquisition cost. This is generally known with certainty. The other two factors are estimates. The estimated useful life is some measure of the period during which the asset will be of use to the transit property. The estimate of usefulness can be a function of time, volume of usage, or some other basis. A transit passenger shelter may be expected to last for some number of years before it has to be replaced and a service truck can be expected to last a different number of years. As it is difficult to know in advance how long an asset will be useful, an estimate must be made.

The other estimate that needs to be made involves the salvage value of a retired asset. This is the amount of value that will remain when the asset has reached the end of its useful life. It is also known as the residual value or the resale value. The salvage value is the amount of money that a transit property would receive if it sold a retired vehicle at the end of its useful life. It is also possible that this residual value may be negative. For example, the cost of dismantling and disposing of a fuel storage tank may exceed the salvage value of the metal from the tank.

Straight-line Depreciation

This has been the most commonly used depreciation method. It is calculated by taking the cost of the asset, less the salvage value, and then dividing by the estimated useful life of the asset.

$$\frac{\text{Cost - Salvage value}}{\text{Estimated life in years}}$$

For an example, we will assume an asset acquired for \$3,000 has an estimated useful life of three years with no salvage value. Using the straight-line depreciation method the annual depreciation charge would be:

$$\frac{\$3{,}000 - \$0}{3} = \$1{,}000 \text{ per year}$$

This method is based upon the assumption that the depreciation of an asset is a function of the uniform passage of time. Thus, if a particular transit passenger shelter has an estimated useful life of five years, in each year of its useful life, 1/5 of the acquisition (or construction) cost of that shelter would be shown as depreciation. Due to its simplicity, the straight-line method is widely used. It would be difficult to estimate the number of passengers who will use the shelter each year, so basing depreciation on level of use would be difficult.

There are several objections to the straight-line method. First of all, it assumes that maintenance expense will be the same in each period. Normally, as an asset (such as a bus) ages, more maintenance will be required in its later years than was necessary during the earlier years of its operation. These higher maintenance charges may be an indication that more of the usefulness of the vehicle was used up in its earlier years. Therefore, the true cost of operating the bus has seen understated by the depreciation charges in those earlier years.

Straight-line depreciation also assumes that an asset contributes the same economic usefulness (revenue generation) in each year of its productive life. As vehicles become older they may become part of the peak pool or reserve pool. They are, therefore, used less frequently in their later years than when the vehicles were new.

Production or Use Depreciation

Under this method, the depreciation of an asset is assumed to be a function of use rather than of the passage of time. The useful life of a vehicle may be described in terms of the number of miles of operation that it can be expected to provide. The depreciation charge for a given period then will be based upon the actual number of miles the vehicle was used in that period.

Depreciation is allocated on a per unit basis by means of the following formula:

$$\frac{\text{Cost - Estimated salvage value}}{\text{Total use/use during period}}$$

which is the same thing as:

$$(\text{Cost - Estimated salvage value})\,(\text{Use during period/Total use})$$

Note that the numerator of this formula is identical to that of the straight-line depreciation formula. The difference between the two formulas involves the denominator. The estimated number of units of output is used as the basis for allocation in this formula rather than a measure of time as found in the straight-line formula.

For an example will we assume an asset has an acqusition cost of $3,000 and no salvage value. Further, we assume that the asset has a useful life of 36,000 miles. Usage over a three-year period is 20,000; 10,000, and 6,000 miles per year, respectively.

($3,000-$0) (20,000/36,000) = $1666.67

($3,000-$0) (10,000/36,000) = $ 833.33

($3,000-$0) (6,000/36,000) = $ 500.00

Different patterns of actual usage would result in different arrangements of depreciation expense in a given year.

Accelerated Depreciation

There are two types of depreciation which are referred to as "accelerated" depreciation methods. These methods produce depreciation charges which are larger in the early years of a capital asset's life than in the later years. These methods are based on the assumption that an asset's earning power declines over time. The depreciation method choosen should recognize this fact in its allocation of depreciation expense.

Double-declining-balance. This method of depreciation is calculated by the straight-line depreciation charges for the net book value of the asset. The net book value is the acqusition cost less the accumulated depreciation from prior periods. The estimated salvage value is ignored in this method.

Under the straight-line method, the annual depreciation rate for an asset with an estimated life of three years would be 1/3. (Each year an equal amount would be written-off, thus 1/3 each year for 3 years.) The double-declining-balance method would double this rate to 2/3. The double-declining-balance rate is then applied to the remaining book value (acquisition cost - accumulated depreciation).

Once again we shall assume an asset with an acquisition cost of $3,000 and an estimated three year life. Salvage value is ignored. (It is $0 in this example anyway.)

TABLE 2.1 Double-Declining-Balance Depreciation Example

Year	Acquisition Cost	Accumulated Depreciation	Remaining Book Value	Factor	Depreciation Charge
1	$3,000	$ 0	$3,000	2/3	$ 2,000
2	3,000	2,000	1,000	2/3	667
3	3,000	2,667	333	2/3	222

In our straight-line example the annual depreciation charge was $1,000. Under double-declining-balance we double this amount to $2,000 for the first year's depreciation charge. The same result is obtained by developing a fraction of two over the number of years of estimated life for the asset. Thus the factor 2/3 is calculated for the three-year life span. (See Table 2.1.)

The depreciation charge is subtracted from the remaining book value to give a new remaining book value: $3,000 - $2,000 = $1,000. In year two, the factor would be applied to the remaining book value to provide a depreciation charge of $667.

Under the double-declining-balance method there will always be a residual amount remaining at the end of the asset's useful life. This amount can be used as the salvage value, or the final year's depreciation charge can be adjusted to include all of the residual amount to bring the remaining book value figure to $0. In the example above a depreciation charge of $333 in the final year would be required to bring the remaining book value amount to $0.

Sum-of-the-year-digits. This formula also allocates more depreciation to the earlier part of an asset's life than to the later part. The years of estimated useful life of the asset are added together and used as the denominator of the fraction. The number of years of life remaining at the beginning of each particular year is the numerator. Thus an asset with a three year estimated useful life would have a denominator of six (3 + 2 + 1). For an asset with an estimated useful life of four years, the denominator would be ten (4 + 3 + 2 + 1).

A $3,000 asset with no salvage value is to be depreciated over a three year period. In the first year 3/6 of the $3,000 acquisition cost, or $1,500, would be allocated as the depreciation charge. In the second year, the charge would be $1,000, while in the third year, it would be $500. (See Table 2.2.)

TABLE 2.2 Sum-of-the-Year-Digits Depreciation Example

Year	Acquisition Cost	Remaining Life	Fraction	Depreciation Charge
1	$3,000	3	3/6 * $3,000	$1,500
2	3,000	2	2/6 * 3,000	1,000
3	3,000	1	1/6 * 3,000	500

Summary

Table 2.3 demonstrates the depreciation charges for each of the three years under each of the methods that we have examined. As can be seen from this table, both the double-declining-balance and the sum-of-the-years-digits methods produce higher depreciation charges in the earlier years of an asset's life than in the later years. The activity method is based on the actual usage of the asset in each year and it is the only method that directly considers actual usage of the asset in determining the depreciation charge for a given year.

The use of an accelerated depreciation method can result in favorable tax consequences for an organization. As non-profit transit firms are not subject to income tax considerations, management may choose to use the depreciation method which best suits the nature of the depreciation experience at the transit property.

TABLE 2.3 Summary Of Depreciation Methods

Year	Straight-line	Production or Use	Double-declining-balance	Sum-of-the-years'-digits
1	$1,000	$1666.67	$2,000	$1,500
2	1,000	833.33	667	1,000
3	1,000	500.00	333	500
Total	$3,000	$3000.00	$3,000	$3,000

CHAPTER THREE

BUDGETING

Purpose of the Budget

Definition

The budget is probably the most important document prepared by a transit operating agency. It serves as a touchstone for management throughout the year, and provides a mechanism for communicating with outside agencies and individuals. Strictly speaking, a budget can be defined as follows:

> "A budget is a plan for the accomplishment of programs related to objectives and goals within a definite time period, including an estimate of resources required, together with an estimate of the resources available, usually compared with one or more past periods and showing future requirements." (Thomas D. Lynch, Public Budgeting in America, Prentice Hall Inc., Englewood Cliffs, NJ, 1979, p. 5.)

Purposes

The budget, and variants of it, serve several purposes. The information in the budget is a concise, but limited, image of the organization's activities and objectives. This information serves a number of purposes to different people at various times.

Planning. Fundamentally the budgeting process is an extension of the agency's planning process. The projected activities of the agency, such as amount and type of service offered, special programs, etc., must have been determined in advance. The budget presents these forecasts of activities for the budget year in dollar terms. The budget may provide data to compare and evaluate alternative projects or strategies. The budgeting process is a unique annual opportunity to consider each aspect of the agency's activities and how it should be changed, if at all, during the coming year.

The converse of this is that the budget can be used to explore the effect of resource constraints on the service offered. Budget preparation clarifies the relationships between service offered and operating costs. It also identifies the amount of funds needed to accomplish certain tasks. These two characteristics can be used to identify differences between the resources available and those required, and to either adjust the planned tasks to fit the resources available, or identify the additional funds that must be located.

Management. As a management tool, the budget is used to establish organizational priorities and policy. Top management uses the budget process to coordinate the managers' expectations and programs, thus setting the operational direction for the agency for the budget year. The board and funding agencies can use the budgeting process as a means to establish organizational direction.

Control. The third purpose of the budget is as a tool for ongoing management control. Each responsible manager in the agency should have responsibility for certain budgeted elements, and should be involved in setting the budget for these areas. The agreed upon budget then provides a guideline for the manager's activities and a specific measure of his or her performance.

Concepts in Budgeting

During the past 20 years, various models for the ideal budgeting procedure have gone in and out of favor. In their pure form, each of the models is unrealistic to use in the real world of organizations, information, and politics. Each one, however, has certain valuable approaches to the problem of resource planning and allocation, which can contribute to effective preparation of an agency budget.

Incremental Budget

The simplest form of budget is based on the previous year's expenses, adjusted for anticipated inflation, price increases, and service changes. The advantage of this approach is that it is quick and easy to develop. On the other hand, it does not provide any way to check the efficiency of the previous year's budget, or to represent the link between the budget and the level of the agency's activities. The past year's performance is taken as given, without critical evaluation.

Planning-programming-budgeting

This approach to budget development was introduced in order to provide some systematic way of allocating resources between alternative activities. According to this model, budgeting is the logical outgrowth of a process of identifying the organization's objectives, developing programs to meet the objectives, and budgeting for each program. Programs may span organizational boundaries, resulting in a budget form that does not necessarily correspond to managers' responsibilities, but that may better reflect the actual objectives of the organization.

Management by Objectives

The management by objectives (MBO) model is designed to decentralize the budgeting process and integrate it in the control structure of the organization. Each responsible manager is required to negotiate with his or her supervisor and set objectives to accomplish within the budget period. These objectives are translated into resource requirements that provide a basis for management control and staff evaluation throughout the budget period.

MBO uses the budget process as a tool for management. Its effectiveness depends on top management's overall style and effectiveness, including its ability to set goals and objectives and to negotiate ambitious yet achievable objectives with individual managers. One of the effects of an MBO process is that it decentralizes the budgeting process by requiring each actor within the organization to take responsibility for his or her area of activity. This brings planning and projection closer to the individuals who will actually be involved, and who theoretically have a more complete and accurate knowledge of the activities.

Zero-based Budgeting

The concept of zero-based budgeting was introduced to provide a mechanism for reviewing programs from past years and cutting out the ineffective and wasteful activities. In theory, the agency activities are broken into comparable "decision units," with each unit being the responsibility of a single manager. (One manager may have several decision units.) For each unit a "decision package" is prepareed including the budget for the activity and uniform measures and descriptions useful for comparing decision units. The activities can then be ranked by cost effectiveness, or some other criterion, and the most productive ones are then selected for funding.

This procedure can result in enormous amounts of paperwork as each element of a program continuing from previous years must be evaluated from scratch. Annual repetition of the exercise is a heavy and perhaps unnecessary burden. The key concept it introduces to budgeting is that of questioning past assumptions and trends. All activities should be reviewed periodically to see whether they continue to be useful, and whether the same objectives could be achieved more effectively or efficiently using another strategy.

Key Concepts

Without adopting any of these models in its pure form, principles can be drawn concerning desirable characteristics of a budgeting process:

1. It draws on data from the past year's experience.

2. It should be built on a carefully thought out program of activities, based on the agency's objectives.

3. It should be developed in a decentralized process, emphasizing communication with managers.

4. It should examine activities of questionable cost effectiveness and avoid taking past experience as unchangeable.

Preparing the Budget

Preparation of the operating budget is a time consuming and detailed undertaking that brings together resources from all parts of the agency. It is normally the responsibility of the Executive Director (or General Manager) or a close assistant, such as the Director of Finance. This person must be able to work closely with agency management to assemble all the data required for the budget.

Requirements for Budget Preparation

Because of the importance of the budget both within and outside the agency, and because of the complexity of budget preparation, the management support structures are very important. The budget cannot be created and implemented in a vacuum, but is closely tied to many agency operating procedures. Data for budget preparation must be drawn from agency records, projections must be based on agency objectives and plans, and budget adherence must be monitored through the agency's accounting system.

Ongoing management information system (MIS). Routine collection and reporting of key operating measures through an effective MIS has three functions related to the budget.

1. Data provided by the MIS may identify operating deficiencies requiring special attention, such as excessive road calls or passenger complaints. Any special resources needed to address these problems should be accommodated in the budget.

2. Data provided about the operation, such as hours and miles of service, hours of wages paid, ridership, revenues, etc., is essential to understanding and forecasting operating costs.

3. During the budget year, MIS reports allow management to track agency performance with respect to the projections in the budget, and to explain deviations as they occur.

Adequate accounting system. The usefulness of the budget for internal control purposes depends on having an accounting system that can provide timely reports in a form that can be compared with the operating budget. Accounting records are also a source of important data for budget development.

Information on service provided. In order to justify the financial requirements of the agency, an inventory of agency products and activities is required. Detailed data on the amount and types of transit service offered during the current and past years is required to project service offerings during the budget year. In addition, agency activities such as public information, ridersharing matching, marketing campaigns, special studies, and other less quantifiable activities should be inventoried and listed for the budget year.

Procedure for budget submission and approval. Because of the number of participants in the budget process, and the length of it, it is important to have in advance a structure for this process. This structure should include the information and forecasts required, staff responsibilities for budget preparation, and the timetable for budget development. The form of each report required by external reviewing agencies and the schedule and form of external review should be predefined.

Normally the structure will change little from one year to the next. Once established, past years' procedures can provide a model for current preparation.

The Process

The budgeting process can be divided into three overall phases. The first phase is internal preparation. This is the most time consuming and detailed portion of the process. The structure of the budget must be determined. Detailed information and forecasts on costs and operating statistics must be collected from throughout the organization. This information must be transformed and synthesized into a comprehensive and coherent document.

The second phase, external review and negotiation, draws on the manager's political and communication skills. This phase is a test of the agency's network of community and political support, built up throughout the year, or years.

The final phase, implementation of the budget, provides a guideline throughout the year to the performance of the agency and of individual managers. Deviations from the expected performance are an indication that the assumptions used in developing the budget are not consistent with the actual trends.

Internal Preparation

The steps of internal budget preparation include: structure definition, revenue assessment, data collection, cost forecasting, documentation, and internal review. The process often involves various iterations of these steps, as additional data requirements are identified, forecast costs are not met by revenue supply, and additional requirements are imposed by external reviewers.

Structure

Because of the various functions of the budget document, the structure of the budget must be carefully thought out in order to accomplish each function most effectively. Three types of organization must be considered in establishing a budget structure: time periods, accounting categories, and the organization of responsibility.

Time periods. There are two levels of time structure to be considered when defining the time periods for budgeting: the fiscal year and the periodic reporting or accounting periods. Time periods used for budgeting and accounting purposes should be selected to be as well coordinated as possible with each other and with other time periods used. If these factors are not taken into consideration, time consuming adjustments to accounting reports are likely to be required to make them comparable to budgeted figures, or to put them into the format required by the external agencies. The fiscal year is often selected to coincide with the fiscal year used by the state or municipal funding agency. This simplifies budgeting and annual reporting.

The budget used for review by the board and outside agencies usually presents costs for an annual period, or possibly for four quarters. Further detail makes the budget confusing and may complicate discussions with outside agencies. For internal purposes the budget must be subdivided into reporting periods ranging in length from four weeks to three months (a quarter). A primary consideration in determining the length of the accounting period used is external reporting requirements. If you are required to bill the state monthly for reimbursement of operating expenses, it makes sense to use months as the accounting period. The disadvantage of using months is that they vary

Accounting system. The line items or expense categories used for budgeting and accounting should coincide for two reasons. First, once the budget has been approved by the necessary outside agencies, its main purpose becomes internal control. Frequent comparisons are required between the expected expense figures, as included in the budget, and the actual expenses during the year, as reported by the accounting system. The more closely the budget and accounting structure resemble each other, the easier this comparison is. Second, the primary source of data in preparing each year's budget is the accounting records from the previous year. If expense records coincide with budgeted line items, the task of extracting relevant information is made much easier. In order to make these comparisons the divisions of the expenses in the budget and accounting reports should coincide.

Many external constraints may apply to the account categories used. Federal reporting requirements, as defined by Section 15, apply to all agencies receiving assistance from Section 9. In addition, state or local requirements may apply.

Organization of responsibility. In an agency where budget responsibility is shared by several managers, this should be reflected in the structure of the budget. Not only will each manager's input to the budgeting process be identifiable, but the line items that fall under their authority will be well defined. For example, a separate line item for materials and supplies may be required for the office manager, the maintenance manager, the operations manager, and the marketing and planning manager. Alternatively, all these people could be required to purchase their supplies through the office manager, who would then be responsible for the only line item for materials and supplies. The Section 15 reporting requirements have included some divisions by responsibility by breaking out some expense categories by function.

Revenue Assessment

The majority of transit operations' budgets are constrained by the amount of revenue and financial assistance available to them. In order to determine a target size of the budget, it is helpful to estimate the amount of revenue that will be available. Contacts at funding agencies (state, municipal, and federal agencies) should be sounded out to identify what scale of change, if any, they anticipate. If dedicated tax revenues are used for funding the operation the amount of revenue expected from this source should be estimated. Fare revenues should be projected. If a fare increase is anticipated, the effect of the increase on ridership and total revenue should be estimated. (A technique for estimating the effect of a fare increase is described below.)

Data Collection

Data should be collected from each manager concerning their anticipated operating expenses for the coming year. This will include three types of information: activity plans and estimates, background data for estimation of variable costs, and direct estimates of fixed or indirect expenses.

Activity plans and estimates. Each manager should describe what activities and projects they anticipate carrying out during the budget year. This would include estimates of the amount of service provided, changes in scheduling that might affect costs (such as introduction of part-time operators), special programs (such as an intensive marketing or a maintenance campaign), hiring expectations, and any other factors that would contribute to the cost of their program.

Background data. Background cost information is required to estimate the variable costs related to providing service. Projected cost per gallon of fuel, cost of tire contracts, projected fuel consumption, pay hours per service hour, and effective operator wage (including contract or cost of living allowance increases and progression effects) are needed.

Direct estimates. Each manager should also provide direct estimates of fixed costs within their jurisdiction. These will include building utilities, office equipment, janitorial services, meeting fees, travel, contracted services, insurance, and other expenses that do not vary with the amount of service offered.

The collection of data provides an opportunity for responsible individuals throughout the agency to become actively involved in the budget development process. Staff involvement accomplishes three things:

1. It allows the managers' plans to be reconciled with each other and with reality. Cross-departmental programs can be planned and coordinated.

2. It taps the detailed information on day-to-day costs and operations that is familiar to managers.

3. It provides a mechanism for negotiating goals and budget levels that will be used for control purposes during the budget year. This can be used to implement the concepts of MBO.

Cost Forecasting

Based on the amount of service to be offered, the unit costs projected, and the direct estimates of other costs, the projected expenses by line item can be calculated. Each cost item in the budget is one of three kinds:

1. Fixed costs do not depend on the amount of the service being offered.

2. Variable costs are directly related to the amount of service offered. Variable costs may be related to one of several service measures, such as hours of service, or peak vehicles. Fuel, for example, depends on the miles of service driven, while wages depend on the hours of service offered. Each of these can be measured in several ways, such as vehicle hours, revenue hours, platform hours, etc. It does not matter for budgeting purposes which one is used, as long as it is used consistently throughout all calculations.

3. Semivariable costs fall between these two types. They vary with the amount of service, but the relationship is not direct. For example, a small increase in hours of service will not necessarily require an increase in maintenance wages, but a large increase may require hiring an additional mechanic and a resulting wage increase. Semivariable costs are harder to estimate since the relationships between them and the service operated are not clearly defined. Usually a reasonable estimate can be made based on experience.

Table 3.1 indicates one classification of costs as fixed, variable, or semivariable, and the measure of service to which they can be related.

TABLE 3.1 Costs By Type

	Measures of Service			Cost Type		
Expense	Bus Hours	Bus Miles	Peak Buses	Variable	Semi Variable	Fixed
Operator Wages	X			X		
Vehicle Servicing	X			X		
Fuel		X		X		
Tires		X		X		
Insurance		X		X		
Road Supervisors	X				X	
Maintenance Supervisors	X				X	
Vehicle Maintenance	X				X	
Maintenance Expenses	X				X	
Tickets			X		X	
Public Information			X		X	
Licenses			X		X	
Vehicle Leasing			X		X	
Administrative Staff Costs	X					X
Rent			X			X
Building Maintenance			X			X
Building Utilities			X			X
Staff Cars			X			X

Source: Booz, Allen & Hamilton, Inc.
Bus Route Costing Procedures A Review, Technology Sharing Program, U.S. Department of Transportation, May 1981.

Documentation

The many detailed pieces of information that make up the budget must be summarized and concisely documented. For internal use, this should include any assumptions that were used so that the budget may be revised by another staff member if necessary, and so that it may be used as a basis for the following year's budget.

It is helpful to include expense figures from previous years in the summary documentation. Comparing the projected budget with current year budgets and actual expenses provides a guideline for identifying errors and changes. This gives an opportunity to either make corrections or prepare an explanation of major deviations from past performance.

Internal Review

The budget should be reviewed carefully within the agency before it is passed to external groups for review. This internal examination should be used to check for errors, inconsistencies, and issues that are likely to be raised by other reviewers. This review should involve internal staff and managers who are likely to spot any problems.

A quick measure of the reasonableness of a budget, and one that is sure to be used by reviewing agencies, is to compare the proposed budget with performance during the current and past years. The percentage change of each line item should be calculated, as well as the percentage change in quantity of service offered (See Table 3.2.) Overall, each change should be close to the percentage change in service, plus the expected rate of inflation. Any line items that increase at a rate significantly different from this should be examined, and the reason for the unexpected change identified. For example, introducing new maintenance procedures might result in a higher parts cost in order to reduce the number of road calls: this might cause maintenance materials and supplies to increase much faster than inflation.

Performance measures that are routinely monitored in operation should be calculated for the projected and budgeted figures. These can be checked for reasonableness against current agency performance. The reason for significant changes should be identified. Reviewing agencies are also likely to use these measures to compare your agency's projected performance and forecasts against those used by other operations of your type.

If a major discrepancy exists between the costs forecast for the planned level of service and the amount of resources available, adjustments to the initial budget may be required. Specific projects or even the amount of service offered may be cut back. This probably will require returning to the cost forecasting step in budget preparation and trying various service levels until an appropriate one is identified.

Table 3.2 Budget Comparison with Past Years

	Expenditures 1983	Budget 1984	Estimated 1984	Proposed 1985	% Change 1983-1984	% Change 1984-1985
501 Wages						
Operators	146832	162013	182552	254292	24.33	39.30
Mechanics	41269	54663	51163	83602	23.97	63.40
Administrative	134357	165951	97032	146442	-27.78	50.92
SUBTOTAL	322458	382627	330747	484336	2.57	46.44
502 Benefits						
FICA	24184	28697	24806	36325	2.57	46.44
Health Insurance	9652	13384	10017	12406	3.78	23.85
Life Insurance	4244	5598	3956	5606	-6.79	41.71
Unemployment	63	265	15113	5000	23888.89	-66.92
Workers Comp.	6978	13807	6889	19502	-1.28	183.09
Sick Leave	22419	13517	13517	9083	-39.71	-32.80
Vacation	22391	17255	17255	10602	-22.94	-38.56
Other pd. absence	164	462	0	500	-100.00	---
SUBTOTAL	90095	92985	91553	99024	1.62	8.16
503 Services						
Promo Services	587	610	606	683	3.24	12.71
Prof. Services	12510	14165	13319	15500	6.47	16.38
Contract Maint.	22642	22777	15080	8000	-33.40	-64.88
Security	15352	16888	16888	16885	-33.40	-46.95
SUBTOTAL	51091	54440	45893	41068	-10.17	-10.51
504 Materials/Suppli	565	700	661	653	16.99	-1.21
Fuel, Lubricants	78407	94826	91931	113500	17.25	19.69
Tires	9657	13880	14529	16430	50.45	18.37
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.						
.						
TOTAL	728428	846853	849570	1233223	16.63	45.16
SERVICE HOURS	33508	41700	43315	41252	29.27	-4.76
FARE REVENUE	178464	237783	178908	236530	0.25	32.21

External Review

For agencies relying on outside discretionary assistance, such as an appropriation from municipal general funds, the external review and negotiating process can be as important as the analysis that goes into preparing the budget. Quality analysis is rarely sufficient to ensure budget approval, because the process is usually quite political. There are measures that can be taken to increase the likelihood of approval of an acceptable budget.

External review begins with board approval, since a copy of the budget is likely to be made available to the media at any board meeting where it is discussed. Once the media have received and reported on the proposed budget, your flexibility to make revisions internally is reduced.

Preparation

Although these interagency negotiations reach a climax during the budget process, the outcome of extended review is likely to depend on the groundwork of interpersonal and interagency relationships that has been established during the past.

One of the most important sources of support for your activities is the base of clients and users of your services. The better defined, more visible, and more active your constituency is, the greater the level of political support for your activities is likely to be. It is, therefore, important to you to identify who uses your services, ensure that they are as satisfied as possible, and, in some situations, to establish formal communications links with them or their representatives. Neighborhood associations, organizations representing businesses that benefit from your service, or constituency groups such as the handicapped or aging, may provide valuable direct or indirect support for your agency's activities. Often, the mere existence of a visible constituency is effective without requiring any specific action on their part.

Good relations with the reviewing agency, and particularly the individuals involved, may significantly speed the budget review process. These relations must be developed over an extended period of time, and not just as budget time approaches. Municipal or state staff, negotiators for contracting communities, and influential council or assembly representatives may all be cultivated as supporters in the review and approval process.

Supporting Documentation

A package of materials for outside review by the news media and other agencies is required. This package should emphasize the product that will be delivered for the projected budget, particularly any planned projects that will improve it. It should anticipate and answer obvious questions about the budget, including major changes from previous years and significant assumptions.

Hearings

Budgets frequently must be presented orally before a review committee. Preparation for the hearing should include materials such as charts and handouts necessary to clarify any major points you wish to make. A dry run of the presentation in front of agency staff can be very helpful, both to smooth the rough edges of the presentation, and to anticipate difficult questions and objections that might arise.

Negotiations

Many agencies must negotiate for financial assistance. It is helpful to prepare a range of scenarios indicating what the effect of various levels of contribution would be on your agency and particularly on the service you offer. A clearly prepared budget, in which the relationship between the amount of service offered and agency costs and revenues is clearly laid out, can be a very helpful tool in assessing the impact of various levels of funding.

The budget itself may be formulated as a negotiating tool. The more explicitly the relationships between variable costs and service levels are defined, the more easily various scenarios representing different levels of service may be developed. It is helpful to be able to calculate the effect of budget cuts on service offered, so that the impact of deviations from the proposed budget can be assessed.

Implementation

The usefulness of the budget as a management tool depends on how it is used throughout the year. While circumstances may change from the forecasts made for the budget, the budget still provides a baseline from which deviations can be observed and analyzed.

Operating Budget

Once the budget has been reviewed and approved, it must be put into a working form for day-to-day use. This requires dividing each expense category into portions for each accounting period. In many cases the item can be divided equally between the periods, particularly in the case of an accrued expense. Other expense items are likely to vary considerably between periods. Wages, for example are likely to be lower during the period including the Christmas and New Years holidays than during other periods; school holidays may influence wage expenses if additional school service is provided.

The budget will need to be revised if unforeseen changes take place, so that it can remain a realistic guideline to spending levels. If a funding agency changes the level of assistance it provides, adjustments must be made to agree with the new level of resources available, including possibly adjusting the amount of service offered. If the amount of service offered does not match the amount budgeted. If the amount of service offered does not match the amount budgeted, the expense items affected by the amount of service should be adjusted accordingly.

Periodic Reports

Performance during the year is measured in periodic reports that compare the actual expenses with those projected by the budget. Table 3.3 shows an example format for such a report. The budgeted and actual expenses are used to assess performance for the period. Year to date budgeted and actual figures complement the period information by smoothing out fluctuations that may occur from one period to the next.

Variance Tracking

When actual expense data from each accounting period is available, it should be compared carefully, line item by line item, with the budgeted amounts. Differences from the budget should be calculated, both in dollar amounts, and as a percentage of the budgeted amount.

Wherever a significant deviation from the budget occurs, an explanation should be sought. Variances between budgeted and actual expenses may occur because the amount of service offered is different from the amount planned and budgeted. In other cases expenses may be budgeted for an equal amount in each period of the year, while they may actually occur unevenly between periods. On the other hand, variances may indicate a spending trend that needs to be corrected or adjusted through managerial action. In critical situations, such as an increase in fuel prices above the budgeted level, the budget may need to be revised by reducing the budget for a less essential line item in order to provide sufficient funds for essential expenses.

Analysis Techniques

A number of analysis techniques are valuable in preparing the budget.

Linear Average Annual Growth Rate

For lack of a better method, future trends can be extrapolated from past experience. The simplest method for this, as shown in Table 3.4, is to calculate the percentage increase in costs experienced during past years, and use an average rate of increase to estimate the increase during the budget year. The problem with this technique is that it does not respond to trends in the rate of change: for example, if there has been an overall decrease in the rate of inflation over the years examined, this will not be reflected in the forecast.

Table 3.3 Budget Report: May 1984

	Total	This Month		Percent	Year to Date		Percent
	Budget	Budget	Actual	Variance	Budget	Actual	Variance
Casualty & Liability Costs							
50601,Phys Damage Ins	42900	3575	3502	-2.0%	17875	17756	-0.7%
50603,Liability Ins	110808	9234	9363	1.4%	46170	47038	1.9%
50606,Deductbl Payout	816	68	157	130.9%	340	364	7.1%
50608,Other Insur.	2856	238	251	5.5%	1190	1153	-3.1%
506 Total Cas/Liab	157380	13115	13273	1.2%	65575	66311	1.1%
Taxes							
507 Total Veh License	120	10	10	0.0%	50	50	0.0%
Miscellaneous Expense							
50901,Dues/SBSCR	3240	270	258	-4.4%	1350	1295	-4.1%
50902,Travel	4152	346	795	129.8%	1730	1683	-2.7%
50908,Advertising Med	18480	1540	1573	2.1%	7700	8264	7.3%
50999,Other	5820	485	470	-3.1%	2425	2397	-1.2%
509 Total Mis Exp	31692	2641	3096	17.2%	13205	13639	3.3%
Interest & Expenses							
511 Total Interest	44411	3701	2964	-19.9%	18505	16836	-9.0%
Leases & Rentals							
51210,Computer Lease	2076	173	173	0.0%	865	856	-1.0%
51213,Office Equip RN	15600	1300	1285	-1.2%	6500	6485	-0.2%
512 Total Leases/Rntl	17676	1473	1458	-1.0%	7365	7341	-0.3%
Summary							
Total Exp	4582671	384956	362289	-5.9%	1884434	1765085	-6.3%
Total Revs	2133648	180770	168686	-6.7%	886105	798648	-9.9%
Oper Deficit	2449022	204185	193603	-5.2%	998329	966437	-3.2%
Performance Measures							
Exp/Veh Hr	$29.71	$29.48	$30.13				
Exp/Veh Mi	$2.63	$2.61	$2.67				
Rev/Veh Mi	$1.22	$1.23	$1.24				
Oper Ratio	0.47	0.47	0.47				
Pax	4200095	355847	334753				
Pax/Veh Hr	27.2	27.2	27.8				

Table 3.3 Budget Report: May 1984 (cont'd)

	Total	This Month		Percent	Year to Date		Percent
	Budget	Budget	Actual	Variance	Budget	Actual	Variance
Assumptions							
Vehicle Hours	154272	13059	12023		65331	59979	
Vehicle Miles	1743274	147567	135863		738240	677757	
Operator Rate,Effect	8.94	8.94	8.98				
Mechanic Rate,Effect	8.78	8.89	8.89				
Fuel Unit Price	0.99	$0.99	$0.97				
Oil Unit Price	0.78	$0.76	$0.70				
Revenue Per Veh Hr	13.72	13.74	14.03				
Line Items							
Salaries and Wages							
50101,010,Operators	1572083	133092	122536	-7.9%	645687	592801	-8.2%
50102,010,Supervisors	140288	11691	10957	-6.3%	58453	57946	-0.9%
50102,041,Mechanics	373153	31471	32066	1.9%	147159	148042	0.6%
50102,042,Foremen	88489	7374	7311	-0.9%	36871	36974	0.3%
50102,160,Administration	228810	19067	19326	1.4%	95337	95882	0.6%
501 Total Labor	2402823	202695	192196	-5.2%	983506	931645	-5.3%
Fringe Benefits							
50201,Soc. Security	175762	14826	14057	-5.2%	71947	68096	-5.4%
50202,Pension	183632	15490	14687	-5.2%	75169	71145	-5.4%
50203,Hosp/Med Ins	210600	17100	18652	9.1%	85500	88604	3.6%
50204,Dental Ins	12810	1035	1392	34.5%	5175	6294	21.6%
50205,Life/AD&D Ins	8460	705	712	1.0%	3525	3557	0.9%
50206,Disability	16500	1375	1372	-0.2%	6875	6857	-0.3%
50207,Unemployment	24924	2077	2085	0.4%	10385	10413	0.3%
50208,Workmens Comp	70800	5900	5869	-0.5%	29500	29780	0.9%
50209,Sick Leave	21053	1774	1813	2.2%	8631	8331	-3.5%
50210,Holidays	85242	7185	7086	-1.4%	34934	33189	-5.0%
50211,Vacation	107108	9032	9354	3.6%	43863	40967	-6.6%
50212,Oth Paid Absence	7666	646	615	-4.9%	3141	2983	-5.1%
50213,Uniforms	9792	816	822	0.7%	4080	3954	-3.1%
502 Total Fringes	934348	77961	78515	0.7%	382725	374169	-2.2%
Services							
503 Total Services	80280	6690	6924	3.5%	33450	36902	10.3%
Materials & Supplies							
50401,Fuel/Lubricants	666439	55884	44577	-20.2%	276096	220912	-20.0%
50402,Tires	72000	6000	5486	-8.6%	30000	27482	-8.4%
50499,Transfers,Etc	11076	923	956	3.6%	4615	4527	-1.9%
50499,Parts	122029	10330	9510	-7.9%	51677	47443	-8.2%
50499,Other Materials	19056	1588	1429	-10.0%	7940	8046	1.3%
504 Total Mtls/Supplies	890600	74725	61958	-17.1%	370328	308410	-16.7%
Utilities							
505 Total Utils	23340	1945	1894	-2.6%	9725	9782	0.6%

Table 3.4 Trend Forecasting Techniques

Year Number	Calendar Year	Revenue	Percent Increase	Regr. Point	Average Growth (Linear)	Average Growth (Compound)
1	1975	874196		819417		874196
2	1976	879255	0.58%	832159		889267
3	1977	858592	-2.35%	844901		904598
4	1978	807482	-5.95%	857643		920193
5	1979	825743	2.26%	870385		936058
6	1980	816433	-1.13%	883127		952195
7	1981	837092	2.53%	895869		968611
8	1982	891013	6.44%	908611		985310
9	1983	958147	7.53%	921353		1002297
10	1984	1019584	6.41%	934095		1019576
11	1985			946837	1038082	1037154
Total			16.33%			

Average Annual Growth Rate (Linear)=16.33/9 =0.018142

Year 11 Revenue = 1019584* (1+.018142)= 1038082

Average Annual Growth Rate (Comp.) = (1019584/874196)**(1/9)-1= 0.01724

Year 11 Revenue = 1019584* (1+.01724)= 1037154

Linear Regression: Revenue= A+ B * Year Number
= 806675 + 12742 * Year Number

Year 11 Revenue = 806675 + 12742 * 11 = 946837

Compounded Average Annual Growth Rate

Another method of creating an average rate of growth is based upon determining a percentage increase which if compounded annually, starting with the value of the first data point, will equal the value of the data point for the final year of the period. This line which connects all of the compounded points can be extended into the future as a projection. This method provides a similar, but slightly different, result from the simple averaging of annual changes. The results are slightly different because this method relies only on the beginning and ending values and ignores the fluctuations of the intermediate data points. Determining the compounded averate rate of growth is demonstrated in the following example:

$$\text{Average rate of growth} = \left(\frac{\text{Ending value}}{\text{Beginning value}}\right)^{1/(n-1)} - 1$$

where:

n = period of years = 10

Ending value = 1,1019,584

Beginning value = 874,196

$$\text{Average rate of growth} = \left(\frac{1{,}019{,}584}{874{,}196}\right)^{1/(10 - 1)} - 1$$

$$= 1.1663105^{1/9} - 1$$

$$= 1.01724 - 1$$

$$= .01724 \text{ or } 1.724\%$$

Linear Regression Analysis

In some cases more sophisticated tools may be used to represent the factors that affect the item being forecasted. The expected accuracy of the forecast generated this way depends on various statistical factors. The completeness with which the model represents the various causes of change is one of these. An equation that predicts ridership without taking account of unemployment may work fine until the year a recession occurs, but may badly misrepresent ridership that year. Another problem can be caused by a model that requires data that is not available with sufficient accuracy.

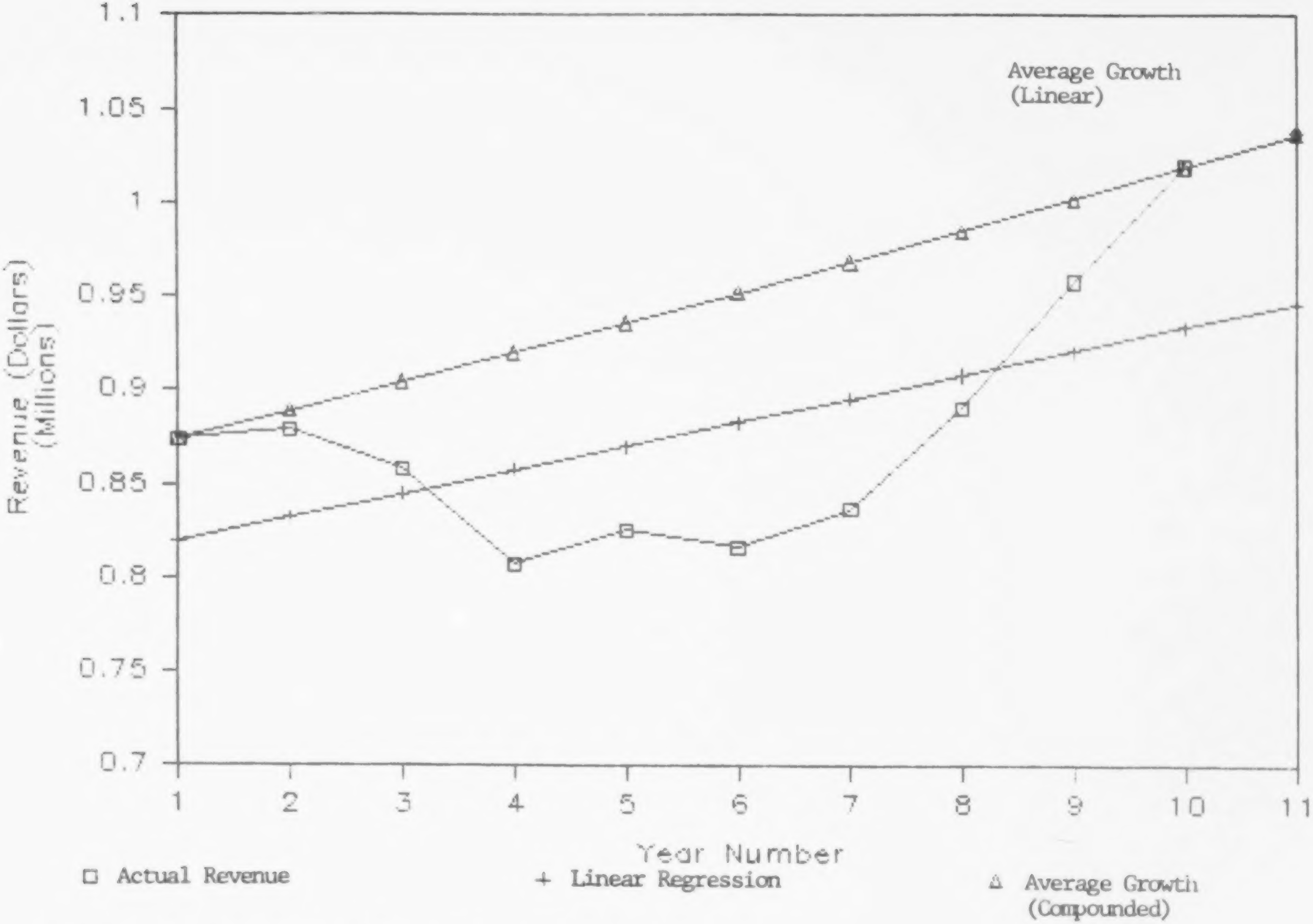


FIGURE 3.1 Comparison of forecasting techniques.

Multiple regression, similar to linear regression described above, can include a number of variables that may help to predict the desired information. For example, ridership may depend on economic conditions, unemployment levels, fares, amount of service, and other factors. If historic information on these factors is available for a number of years, they can be included in a multiple regression, producing an equation that can be used to predict ridership, given estimates of unemployment, fares, etc. Various statistical programs are available for microcomputers and larger computer systems to perform the regression.

Sophisticated models have been developed to help estimate certain cost elements in the budget, and to project them for several years into the future. These are available as computer programs for various types of computers. Several examples are discussed in Chapter Ten.

All three of these methods are summarized in Table 3.4 and are graphically displayed in Figure 3.1. All are valid techniques, but each provides different results. The best strategy to use when making projections is not to rely on any single technique, no matter how impressive or sophisticated it may appear to be. Examine a variety of options and look for similar results. In many cases, the simpler procedures are as valid or better than other methods.

Cost Allocation

As discussed previously, many variable costs included in the budget depend on the amount of service that will be offered during the budget year. Operator wages, fuel, tires, and spare parts are all items directly connected with the number of hours or miles of service operated. Other expenses such as fringe benefits and mechanic wages, are indirectly connected to the amount of service. The budget can be most effective as an planning tool for the organization if these relationships are incorporated in the budget.

The most direct way to estimate these costs is to review each expense line item in the budget, and identify those that are directly or indirectly associated with the amount of service. For example, fuel, spare parts, and tire expenses are all directly related to the miles of service operated. Hours worked, and thus wages paid, plus those benefits directly tied to wages paid (pension, and FICA, for example) are related to hours of service operated. The exact relationship can be found by analyzing costs from past years.

In order to project variable costs, a cost of the item per unit (hour, mile, or other measure) of service must be determined. In many situations this can be done by determining average costs for the pervious year. For example, the cost of parts is related to the miles of service operated, and the average cost can be determined by dividing the previous year's parts cost by the number of miles operated. This average is based on the previous year's experience and may not be valid for the budget year if changes occur, such as a significant portion of the fleet coming out of warranty or the average fleet age changing. If no such changes are expected, the average rate obtained this way can be adjusted to include effects of inflation, and used to forecast parts costs for the budget year. If changes will be occuring, an estimate of their effect on the average must be included before it can be used for cost projection. Similar methods of calculating other variable costs are shown in Table 3.5. (This technique is not accurate for predicting the cost of additional service, or service segments, such as a route or time of day. Unit costs for such small portions of service may vary significantly from the average cost found in this way.)

The dominant cost in most transit operating budgets is wages. Operator wage costs are a variable cost, closely related to the amount of service offered. They can be calculated directly from the hours of service planned if the average hourly operator wage and the number of pay hours per platform hour are known, using a formula such as that shown in Table 3.5. Costs of paid absences by operators (sick leave, vacation) must be calculated from the average number of days taken from each type of absence by operators in a year. The combination of wages for time worked and wages for paid absences cover the cost of all operators for the year.

Mechanic salaries are semi variable and can be treated as a fixed cost unrelated to the amount of service offered unless a significant change in the amount of service is planned, which would require hiring or laying off a mechanic, or a change in maintenance practices will require a change to the mechanic force.

Fuel costs can also be estimated directly from the amount of service to be offered. The key to correctly estimating the fuel price is forecasting the price of fuel accurately.

Some discretion must be used in adopting previous years' statistics for future forecasts. Changes in operating conditions or major changes in the amount of service provided could make past experience an inaccurate indicator of future needs. For example, a major increase in the amount of service offered could result in hiring junior operators, and therefore lowering the effective wage rate. Changes in work rules and contract increases will change the amount of time paid per hour of service and the effective wage rate.

Revenue Projection

A special forecasting technique applies to fare revenue. Very often fare increases are required in order to generate additional fare revenue. Fare increases are a double-edged sword: while they increase the amount contributed by each passenger, they usually result in the loss of some passengers. As a result the increase in fares received is not as great as if all existing passengers simply paid more.

A frequently used rule of thumb, known as the Simpson - Curtin rule, is that every 3% fare increase results in losing 1% of passengers.

This rule is a vast generalization: the actual ridership loss depends on the characteristics of particular riders, what alternative transportation they have, why they are making the trip, what their financial resources are, etc. The sensitivity of ridership to fare changes is known as elasticity. Elasticity is the percentage change in ridership produced by a 1% change in fare: the 3% rule of thumb corresponds to an elasticity of 1/3 or .33. A higher elasticity indicates greater sensitivity to fare changes. Unless you are able to calculate elasticities of your ridership by identifying exactly what percentage of your ridership in each fare category was lost solely as a result of past fare increases, this tool is most useful for estimating the range of revenue increase that can be realistically expected from the fare increase. Table 3.6 illustrates an example of fare revenue projection.

TABLE 3.5 Examples of Variable Cost Calculations

Expense Object	Data	Project Cost
Parts	Parts costs= $\frac{\text{Annual parts cost}}{\text{Annual miles of service}}$	Projected parts cost * planned miles of service
Fuel	Fuel consumption= $\frac{\text{Annual gallons used}}{\text{Annual miles of service}}$	(Planned miles of service/projected fuel consumption) * projected fuel cost
Operator Wages	Part time rates = $\frac{\text{Annual operator hours paid for time worked}}{\text{Annual hours of service}}$ Average operator wage	Planned hours of service and part time rate * projected average wage
Tires		Projected lease cost per mile * planned miles of service

Table 3.6 Revenue Projection Using Elasticities

A	B	C	D	E	F	G	H	I	J	K
Service	Annual Riders	Present Fare	Present Revenue	New Fare	Percent Fare Increase	Percent Riders Lost	New Riders	New Revenue	Revenue Change	Assumed Elast.
	Data	Data	B*C	Data	((E-C)/C)*100	F*K	(1-(G/100))*B	E*H	I-D	Data
Urban System										
Adult	1237281	0.50	618641	0.60	20.0%	6.7%	1154796	692877	74237	0.33
E&H	674881	0.25	168720	0.30	20.0%	6.7%	629889	188967	20246	0.33
Student	592702	0.35	207446	0.40	14.3%	4.8%	564478	225791	18346	0.33
Total**	2504864		994806				2349163	1107635	112829	
Percent Change							-6.2%	11.3%		

CHAPTER FOUR

CASH CONTROL

Introduction

Cash control includes all the procedures managers take in order to ensure the safe and orderly movement of cash from the time that it leaves the possession of the customer until it is deposited at the bank. Sound cash control procedures are important for many reasons. Any business which handles large quantities of cash must protect itself from theft or face the possibility of high insurance premiums and the potential for severe injuries to employees. In addition, firms which maintain strict cash control measures will find that these policies foster a belief among employees and the public at large that the company is accountable for, and protects, the public's investment.

Embezzlement, or employee theft, is a growing problem for many businesses. The American Management Association (AMA) has reported that about $4 billion in cash is lost to employee dishonesty each year. It is a fact of human nature that employee theft will occur, and it is the duty of a general manager to create an environment that will minimize the effect of this tendency. More generally, sound cash control reflects upon the management of a company as a whole. Furthermore, since most urban transit properties are in the public sector, they can ill-afford the harsh public criticism which will almost inevitably follow large cash losses caused by inadequate control measures.

The need for effective security systems is usually recognized as something of particular concern to large companies handling large amounts of cash. However, according to the American Management Association small companies suffer losses from crime which are proportionately over three times greater than those of larger businesses. Managers of smaller firms are frequently poorly informed about how best to protect their revenues and assets, and the potential for employee theft is not recognized as a great problem.

Coordination is a key to proper cash control in any business, yet it may be a special challenge in a transit system due to the fact that this function will frequently cross departmental lines. Cash control begins in the transportation department, as passengers board the bus and deposit their fares into the farebox. When the bus reaches the end of its run, it is pulled into a maintenance facility, where the emptying of the farebox is only one of a host of activities which the maintenance department accomplishes. Later, the cash must be accounted for and deposited by the finance department. Thus, while the cash crosses several departmental lines, it is clear that we need to view the control function as a continuous process. The chain of cash control can only be as strong as its weakest link. This chapter examines those links and offers suggestions as to how they can be strengthened.

The Operator

The bus operator typically supervises the first stage of fare collection, and is therefore involved in the cash control process. This takes place when the passenger parts with his or her fare, or presents an appropriate pass, transfer, or ticket. There are two very basic rules which operators must be trained to follow. First, unless a passenger is physically incapacitated, operators must not deposit money for passengers under any circumstance. If the farebox breaks down, the correct procedure is either to take the bus out of service, or allow the passengers to ride for free. The aim of this rule is simply to ensure that passengers never get used to handing money to the operator.

The second basic rule which the operator must follow is to inspect each fare, in order to ensure that the correct amount has been deposited. The operator also enforces the other fare rules of the transit system by making sure that any transfers or tickets presented by passengers are valid. Often, operators can become lax in this responsibility, perhaps in the not altogether unreasonable belief that most patrons are honest. It is unfortunate, but it is a basic fact of life that an increasing number of passengers will try to cheat the system if they know that there is a good chance that they will get away with it. Keeping dishonest behavior under control is important, not only because of lost revenue. Honest, fare paying passengers can become very dissatisfied if they observe other passengers abusing the system with no apparent control.

In order to perform their functions effectively, transit operators need to have their cash responsibilities clearly defined. The proper procedure for collecting and inspecting each fare must be documented, and dismissal should follow any overt instance of mishandling. The threat of discharge is one of the methods which can be used to control undesirable behavior among transit operators. In order to give the threat credibility, the manager must increase the odds of such behavior being detected at some point. For this purpose, a surveillance program is often helpful. Rather than sporadic "crackdowns", it is always preferable to have continuous spot-checks of operators taking place. In the interest of a healthy labor-management relationship, unions should be advised that such monitoring is occuring. Besides, by letting operators know that they may be watched from time to time, the chances are better that they will obey the rules consistently.

Surveillance need not be overly expensive. Essentially, a spot-check operation will involve monitors who check operator performance against a system-provided checklist. If deviations from prescribed operator conduct occur, then it is best to have several observations by different monitors prior to the initiation of disciplinary action. This helps ensure that subsequent grievances or arbitration cases have the greatest chances of success.

The Farebox

The farebox is an important component of the fare collection system. It has two, and sometimes three basic purposes. First, it receives the passenger fare, and then displays them for inspection by the operator. Second, it holds the cash securely as the bus completes its run. Finally, it may have a data-processing function--either by counting the fare paid by each passenger and determining whether it is sufficient, or by keeping a running count of the fares paid by all the passengers. Sometimes, it may do both.

Farebox security is important--both on and off the bus. On board, the farebox must be properly bolted to the floor of the vehicle. Regular maintenance of the farebox is critical to successful operation, since fareboxes operate in an environment which is both rugged and dirty.

Physical inventories of the fareboxes must be kept, since theft of one farebox, or of some spare parts could easily undermine the security of the entire system. In order to maintain a high level of security around the fareboxes, access to the keys which open them must be properly controlled by means of written sign-out logs. If a sealing tool is used, access to it must be similarly monitored. Personnel who are responsible for farebox repairs should always work with a witness present. These people have indirect access to the cash, especially if fareboxes are equipped with registers.

Many transit properties have purchased new electronic fareboxes in an attempt to improve cash control. A recent study suggested that although perceived security has improved with this purchase, most of the transit systems that have them have not observed revenue increases. Data on reliability of the new fareboxes is not readily available, but it is clear that the design can be substantially improved. Therefore, managers may wish to defer purchase of new fareboxes of this type until reliability improvements are made. One such potential improvement is equipping the coin mechanism with a device to reject debris. Another is design of a tougher, more abuse-resistant keyboard. The keyboard is used to identify fare types (e.g., elderly, school children, regular, transfer, etc.).

The Vault

The vault is the box within the chassis of the farebox which stores the cash itself. At the end of a bus run, vaults have to be pulled from the fareboxes so that they can be emptied and returned to the bus.

Vaults should always be pulled at the first opportunity when the bus comes into the depot from a run. The removal of the vault should always be formally witnessed, whether this be by the driver, a hostler (bus service personnel) or closed-circuit television. Several other steps should be taken to prevent cash losses at this point. Careful record keeping is a must. Since vaults are interchangeable, records of which vault is in which farebox need to be kept. Vault pullers should also be trained to use the "remarks" section of their recording forms whenever they notice problems with vaults or fareboxes, especially anything resembling tampering. With proper training, vault pullers can also be valuable watchdogs for preventive maintenance, which is needed for both vaults and fareboxes.

If the farebox has a register, the readings from it should be noted at the time the vault is removed from the bus. A witness (such as a driver or hostler) should always be present for this. Another alternative is for the driver to record a reading at the end of his or her run and the vault puller to also record the reading while servicing the bus.

Monitoring the physical inventory of vaults is critical for proper security. Care should be taken to ensure that worn or broken-down equipment is handled in such a way so as to prevent it from being accidentally or intentionally reinstalled. Vault keys must be issued and stored with great care. Clearly, it is of little value to invest money in expensive locking mechanisms if unauthorized persons have easy access to keys. Finally, as in the case of fareboxes, if a vault breaks down, it should be repaired in a shop with a witness present.

The Receiving Vault/Ancillary Equipment

Vaults are sometimes manually emptied into a larger receiving vault, or they may be vacuumed with a probing device. Transit management should check periodically to ensure that this equipment is functioning properly, and is repaired if necessary in a secure environment. Receiver vaults almost always have seals in order to prevent unnoticed tampering; managers or supervisors should familiarize themselves with the proper appearance of these seals and inspect them from time to time.

In other transit properties, vaults may be loaded onto specially designed carts after being pulled from the buses. These carts are then rolled into the money-counting facility. If this is the case, the cart should be checked for safety and security. The cart should be equipped with brakes to prevent accidental rolling. The vaults should be safely loaded onto the cart and be able to be locked there securely. It should be possible to tell easily whether or not the cart is properly loaded. Care should be taken to maintain it at appropriate intervals, and keep it in good repair.

Vault Handling and Physical Facilities

Employees who work in the vault pulling area should be subject to a thorough background check. It may be desirable to issue them with special pocketless coverall uniforms to wear while on duty. The farebox key should always be attached to the employee's clothing, and this key should always be turned in to the supervisor whenever the employee is temporarily absent from the work area. Vault pullers should be carefully trained in the performance of their duties, including the operation of ancillary equipment in accordance with standard operating procedures. Substitute employees who may temporarily be assigned to vault pulling should be familiarized with their duties carefully.

The vault pulling area itself, ideally, should be situated in a specifically designated location. No unauthorized persons (relatives, off-duty drivers, etc.) should be permitted in the area. Good lighting is important. The vault pulling area should be situated well away from any parking areas (including employee parking.) In order to build a security conscious attitude among employees, it may be helpful to post wall signs prominently that draw attention to the need to protect public funds when have been entrusted to the transit system. Other signs may list some important rules or procedures for employees to follow. This is especially helpful if vault removal is sometimes performed by persons on temporary assignment (for example, performing vacation-relief duties).

It is usually not necessary to use security guards in the vault pulling area. Periodic management checks should be sufficient. However, if the vault-pulling is done in an area which is easily accessible from nearby streets, it may be desirable to hire a guard to protect the employees. Installing proper fencing around the property is a better long-run solution.

Money Counting

After the vaults are pulled and emptied, the money must be counted. This is possibly the riskiest part of the cash handling operation, since the cash is now concentrated in one location, and hence, highly tempting as a target for theft.

The room in which the money is counted should be specifically designated for that purpose alone. It should have no concealed storage areas of any kind and should contain nothing which is not required by the money counting operation. The money room should be entirely visible from outside, by means of windows or surveillance cameras. This is an obvious deterrent to internal theft, particularly if other employees pass by outside on occasion. Holdups are discouraged by this arrangement for exactly the same reason.

The entrance to the money room should be secured with high quality locks. The keys for the money room should be kept under strict control.

At the very least, the money room should be equipped with a silent alarm, and preferably one that works in the event of a power failure. Larger properties require more extensive security arrangements. Typically, these properties will have the entrance to the money room manned by a security guard, whose only job is to control access to the room and observe money counting procedures.

Some of the more common features of well equipped money rooms include: bulletproof glazing, a direct telephone line to the manager (or local police), mirrors to allow better supervision of areas inside and outside the money room, and a communication system with which to check employees or drivers attempting to enter the area. Most transit systems use some form of log book to record incidents, and some equip their guardhouses with shotguns or handguns.

If it is decided to use surveillance in the money counting area, the room itself should be designed with this in mind. Specifically, there should be as few corners as possible, in order that a small number of cameras may observe the entire room. Cameras should always be mounted so that it is necessary for one or more employees to continuously look in the direction of the camera, even if they are not looking directly at it. For additional surveillance, cameras might be disguised as fire extinguishers or placed inconspicuously in a suitable office nearby. Whatever measures are taken, signs should be posted advising employees that "because of the need to protect public funds, transit management may use surveillance in this area." The primary use of surveillance is as a deterrent. The possibility of being caught is enough to prevent many employees from stealing.

Regardless of whether surveillance is used in the money counting area or not, some very specific recommendations can be made with regard to money room personnel. In general, it should be noted that money room personnel are a very important part of the transit property's revenue accounting system. In a period of high labor costs, management may be tempted to save money by using low paid employees. This should never be done at the expense of security or efficiency. Thorough initial credit and background checks prior to employee assignment to the money-counting area are most appropriate.

Bonding of employees is a good idea, but insurance companies will pay only when a loss has been proven, and the task of establishing such proof may well be difficult and costly. Hence, bonding should never be considered at as a substitute for other sound cash control procedures.

Money Room Operations

The money room operations typically involve emptying the vaults (if this has not already been done), and recording their contents. The currency must then be sorted, counted, and wrapped. It is then bagged in preparation for delivery to the bank. Tokens, transfers, and tickets are either recycled or destroyed.

Three fundamental safety rules can be stressed at this point. First, in designing the sequence of the money counting operations and determining the responsibilities of the employees, one aim should be for the "separation of powers." In other words, the recording and the handling of cash should always be viewed at as two separate functions. Such an outlook ensures that any fraud will require the collusion of two or more persons in order to escape detection.

Second, money room procedures should be subject to periodic spot-checks by management. Occasional review by outsiders (internal auditors or independent public accountants) may help in finding areas for improvement.

Finally, employee responsibility in the money room should be traceable. Employees must be required to initial the documents which they produce, in order that management may know who is responsible for them. Indeed, by requiring employees to explain any deviations from prescribed conduct, the efficiency and effectiveness of the money room is likely to improve. For this reason, as well as to maintain a highly secure working area in the money room, no unauthorized or off-duty personnel should be permitted on the premises.

Two strategies for management checks can prove especially useful. One is to keep careful records of all vaults which, when pulled, have nothing (or less than $1.00) inside. If the empty vault cannot be explained by some obvious reason (e.g., early road call, traditionally empty run), then management should investigate immediately. A second potentially useful strategy is to have randomly selected vaults stored securely after being counted. The vaults can then be slipped back into the system and recounted the next day to see if the results are identical. Even if employees become aware that this occurs occsasionally, it is an effective deterrent.

Recently, the advent of higher transit fares has brought an increase in the number of dollar bills received in the farebox. These are much more attractive (and easier) theft targets than coins. The newer fareboxes which separate coins and bills have improved the security environment of the bills during subsequent handling. However, managers of properties without these boxes may need to take a special look at how paper money is handled at their counting facilities and take appropriate internal security measures. One transit property found that effective cash control of dollar bills required constant video surveillance of the area in which they were counted.

One relatively simple technique to improve security is to provide pocketless coveralls to money counting employees and require them to be worn at the office. Personnel should never be allowed to work alone. The work area should be arranged so that personnel face each other whenever possible. It is also essential to require money handling employees to take their annual vacations. This allows you to monitor any unexplained differences which could be due to employee theft.

Funds Transfer

Funds transfer involves the movement of funds from the money counting area on the transit property to the bank, where they are deposited. Occasionally, transit systems let the banks do the job of counting the money. More commonly, however, the funds are sorted, counted, and wrapped prior to their transfer to the bank.

Regardless of which method is used, managers need to ensure that the transfer to the bank is accomplished securely. The potential for dishonesty is always present, especially in the case of uncounted funds. Armored car employees may easily find ways of changing a manifest and absconding with some cash. But even if funds have been counted, the sheer volume of the money can cause errors and give dishonest armored car personnel an opportunity to steal. The possibility of holdups is always present.

Some elementary precautions can be taken in order to facilitate secure movement of funds. Armored cars should be used if possible. Moving large sums in unsecured vehicles presents a serious threat to employees, and should be avoided. Other precautions which may be taken include locking and sealing the door of the armored car at the point of departure, to be unsealed only when it arrives at its destination. The route the car takes may be varied to prevent holdups, or a security vehicle may escort the car to the bank. Alternatively, automatic vehicle monitoring equipment may be installed. These security issues are the business of the armored car service, and may be beyond your control. However, you should consider them, and even use them as negotiating issues before contracting with a security service.

In a situation where funds are counted for the first time at the bank, the help of bank management should be enlisted in periodic audits of the counting. They might be requested, for example, to let transit system representatives view the bank money counting operation, or monitor the bank's hiring and security practices in this area. Occasionally, it may be advisable to count all funds during the night at the transit property, and then verify that the bank's count matches this. For the benefit of good relations between the bank and the transit property, the bank should always be advised that this may be taking place from time to time.

Other Loss Areas

While farebox revenues are clearly the greatest concern to managers of transit properties, care should be taken that other potentially significant loss areas are not neglected.

Money Received by Operators

While operators should never handle passengers' money, there are some cases (particularly in the case of smaller rural transit properties) where the handling of fares by the operator is unavoidable.

In such instances, operators must be required to issue a receipt for each cash transaction. This must be strictly enforced if it is to be effective.

Electronic Data Processing

Computers have entered the realm of business decision making in almost all industries, including transit. While the computer can be a great management tool, it has also been used unscrupulously as a tool for theft or other dishonest activity. Transit managers who have computers should carefully monitor who has access to the system, and the output from it. Discarded output must not be allowed to fall into improper hands! Access to the computer system should always be governed by a password system, which identifies each user to the computer. Special software will also help ensure that users only have access to the information which they are authorized to examine.

Incoming Mail

Sometimes, amounts of money are lost to employees who steal money received in the mail. In order to prevent this from occurring, management may institute a log system, in which each piece of mail containing checks or other negotiable items is recorded. Each item should be entered (and initialed) by two employees.

Tickets, Tokens, and Transfers

Careful security and inventory control of these items is a must to avoid their misuse. Used tickets or transfers must be destroyed in a secure environment, while tokens should be handled with the same care as cash. Transfers present special difficulties, since these are rarely sequentially numbered, and hence, inventories are hard to control. At the very minimum, however, they should be stored in a secure location, and operators should be required to return unused transfers at the end of their runs. They should also be required to invalidate all transfers received from passengers.

Several properties have made the move towards weekly or monthly passes. Two possible concerns arise from this trend. First, since these passes are often quite valuable, operators must be reminded to be on the lookout for counterfeit, xeroxed, or improperly presented passes. Second, if sales outlets are used, periodic checks need to be made order to ensure that counterfeit passes are not being sold there. The preferable arrangement for sales outlets is that of a straight purchase, rather than a consignment arrangement. By requiring the outlet to purchase the passes upon receipt, this shifts the burden for security to them. However, this may discourage them from selling passes, in which case it will be necessary to be more flexible.

Conclusion

Careful cash control is a major responsibility for the revenue conscious transit property. The aim is basically twofold: to protect employees from the dangerous and violent circumstances which robberies and holdups bring, and also to protect revenues from theft. Whether or not we trust our employees or not is irrelevant in the design of internal controls for cash handling. Good cash control procedures ensure that honest employees are not falsely accused and detect and discipline the rare embezzler. The honest employee will appreciate the fact that temptation is always present, and will cooperate with sound cash control procedures, providing they are instituted and maintained with the foregoing in mind.

No transit property can afford to be unaware of the need for cash control and the issues and problems related to this function. By vigorously promoting the message that revenues are valued by the company through proper facilities and procedures, as well as the promise of prosecution of any offenders, efficiency is fostered and the public embarrassment of large unexplained cash losses is prevented.

CHAPTER FIVE

INVENTORY MANAGEMENT

Introduction

Inventory may be thought of as a stock of goods that is held for future use. The holding of inventories is frequently associated with manufacturing operations; raw materials, work-in-process, and finished goods awaiting sale are examples of such inventories. Each of these types of inventory is related to a stage in the production process. But in the transit industry, a service operation, it is not possible to inventory the product, transit service. However, the holding of inventories associated with providing the service is still a major concern to transit managers. Fuel, lubricants, engine parts, and electrical components are items which are commonly maintained in inventory. Office supplies and the variety of forms used by the transit property are also elements of inventory.

Types of Inventories

The classification of goods into different types of inventory is generally clearer in a manufacturing or retail setting. Such classification is normally based upon the intended use or function of the item. Nevertheless, it is still possible to fit the various goods held by a transit property into this classification scheme. Items that are maintained in inventory can usually be classified into one of the four types:

1. Raw materials and purchased parts. The purchase and storage of diesel fuel in bulk amounts by a transit property is an example of this type of inventory. Bulbs for vehicle interior light fixtures are another example.

2. Partially completed goods (work-in-process). A transit property which reconditions transit vehicles would likely have an inventory of used components (motors, etc.) which are being rebuilt for installation in a reconditioned bus.

3. Finished goods inventories. A spare bus can be viewed as an item of this type of inventory. The vehicle is available for service if need be, just as a manufacturing firm maintains inventories of its finished product for shipment to customers.

4. Parts, tools, and supplies. The tools used by mechanics and cleaning compounds used by bus service personnel are examples of the goods that would make up this type of inventory.

Inventory Management Objectives

There are two main objectives in the holding of inventories. One is to maximize the level of customer service. In transit this means that a sufficient number of vehicles are operational to meet the required service levels (e.g., no missed trips due to equipment shortages) and, further, that passengers are not forced to endure discomfort due to vehicle defects (e.g., non-operating air conditioning). Maintaining a large enough inventory so that no vehicle is ever idled by having to wait for parts is a way of accomplishing this objective.

The other objective is to minimize the costs related to maintaining inventories. There are a variety of costs associated with keeping inventories (e.g., storage space, handling, lost opportunity costs). If the transit property did not hold inventories these costs would not be incurred, but the ability of the transit system to provide suitable service would be impaired.

It is clear that tradeoffs are involved in the holding of inventories. The flexibility afforded by maintaining a given inventory level versus the cost of holding that level of inventory must be recognized by transit management.

Reasons for Maintaining Inventories

There are several reasons for transit properties to maintain inventories. However, the most important reason is to supply a maintenance program that will keep vehicles in operating condition. Vehicles idled by the lack of supplies or parts do not earn revenue for the transit property. The fleet must contain sufficient operating vehicles to meet peak demand. A low availability ratio (non-operational vehicles/total vehicles) means that more total vehicles are required to meet a given peak-service level. This increases capital costs and storage costs associated with having a greater number of vehicles than should be needed. Furthermore, the spare vehicle might be less efficient than the idled vehicle, thus leading to a higher operating cost.

A second reason to maintain inventories is to take advantage of economic lot sizes. In any production process certain costs can be seen as fixed (not varying with volume) while others are variable (varying in relation to volume). For example, in the printing of route maps certain costs will be the same regardless of the number of maps to be printed. Also, the time required to set up the printing press should not differ regardless of the volume. These set-up costs are considered to be a fixed cost. However, the printer's wages for operating the press is a function of the time to complete the job, which is based upon the number of maps to be printed. The quantity of maps to be printed also affects the amount of paper to be used. Both of these costs would be variable costs since their magnitude varies with the number of maps to be printed.

The effect of fixed and variable costs is that in printing a larger quantity the unit cost (cost per map) will be less than the unit cost of printing a smaller order. There are other costs to be discussed shortly which may offset some of the apparent advantage of printing the larger quantity.

Large inventories can serve as a hedge against future price increases. If management knows of an impending price increase in a particular good it may be advantageous to purchase a certain quantity of the item even though all these units might not be used in the near future. Purchasing the items now at the lower price may be less expensive than waiting to buy them when needed even though you incur some inventory holding costs. It should be noted that if the price does not increase, then the transit property will have suffered a loss in terms of the opportunity cost associated with the funds tied up in the idle inventory. Of even worse consequence would be a decline in the price of the product after the property had purchased it at the old (higher) price.

Inventory is also purchased to ensure an adequate future supply of a good. Expected interruptions due to work stopages affecting a supplier, or the discontinuance of a particular item for which no other source is readily available are some reasons for purchasing items which are not needed to meet immediate usage requirements.

Types of Demand

A major distinction in the way inventory planning and control is managed is based upon the type of the demand for items in the inventory. The inventory management approaches and techniques differ for the two types of demand. These differing approaches affect financial management in terms of the value and length of time that items are maintained in inventory.

Dependent demand items are parts and supplies for which the usage is known of in advance. For example, a preventive maintenance program specifies what work is to be done on which vehicles at a designated point of time in the future. The transit property is able to order the necessary parts for delivery when the work is to be performed. The transit property need not carry extra parts in inventory. Such a practice also allows the transit property to know in advance when vendor payments will come due and how much they will be.

Independent demand would involve unanticipated situations, such as the failure of a bus engine. To meet such unanticipated situations the transit property may keep a variety of items in inventory. It is expected that a particular part might be required at some point in the future, but exactly when is unknown.

Requirements for Effective Inventory Systems

In order to effectively manage an inventory system, there are several requirements that must be met.

Tracking Inventory

The ability to keep track of the inventory on-hand and on-order is essential. You must know what items are currently in stock, the quantity held, and their location. Management also needs data associated with the cost of the various items in inventory.

Demand Forecasts

A second requirement would be a reliable forecast of demand. Knowing the expected usage rates of relevant items in inventory is necessary so that units can be ordered for use in the future. This forecast is frequently based upon historical usage patterns adjusted for changes in operations (e.g., increase in vehicle fleet). There should also be some indication of possible forecast error. This would involve the variability between the expected and actual demand for an item maintained in inventory. A preventive maintenance schedule provides a good forecast of demand.

Lead Time Variability

Knowledge of lead items and lead time variability is the third requirement. The lead time is the interval between the placing of an order and the receipt of that order. The length of time required to receive the order and the usage rate are used to determine the recorder point. The reorder point is the quantity remaining in stock which indicates that an order should be placed. Due to the variability in the time it takes to receive an order, safety stocks are maintained. Safety stocks are kept to reduce the possibility of a stock-out, running out of a particular item, and therefore, not being able to meet the maximum service objective.

Cost Estimations

A fourth requirement entails having reasonable estimates of inventory holding costs, ordering costs, and shortage costs.

Carrying cost. Holding or carrying costs are those costs, associated with maintaining an item in inventory. The capital cost of the investment in inventory is one component. Another component is the inventory service costs for insurance and taxes on the inventory. Storage space costs are associated with storing activities, such as storekeeper wages and the cost of the facility space utilized for inventory storage. There are also certain inventory risk costs related to the possible obsolescence of, damage to, or pilferage of items in the inventory. Further, if there is a need to move the inventory between facilities, additional transportation costs will be incurred. With respect to varying inventory levels, carrying costs are generally thought to be linear. Thus, the carrying cost for a 200 unit inventory level will be twice that of maintaining 100 units of inventory.

Ordering costs. Ordering costs are those associated with the placing of an order with a vendor and of any related follow up activities. Clerical costs attributable to preparing the order, the mailing expense of sending the order, and time spent processing the paperwork when the shipment arrives are some components of this type of cost. Ordering costs are commonly seen as being a fixed charge per order, regardless of the number of units ordered at a given time. Thus, if the ordering cost is determined to be $10 per order, then 100 units purchased in four orders of 25 units per order would incur a total ordering expense of $40. If only two purchases of 50 units at a time were made, a total ordering expense of $20 would be incurred. The total ordering expense amount will vary depending upon the number of orders placed over a given period. Using the above data, the per unit ordering cost for the first example would be 40¢ while in the second example it would be 20¢.

Shortage costs. A shortage cost is the cost associated with not having an item in inventory to meet demand. In the retail or manufacturing setting it would be the lost revenue from a missed sale. In the transit industry, a shortage or stockout might mean that the necessary part was not on hand and therefore a vehicle was not available for service. This requires additional spare vehicles to meet a given level of service, or that certain trips be missed. This has an effect upon the quality of service provided by the transit firm, which impacts not only the farebox, but also the public's perception of that transit firm.

Of the above types of costs, the determination of the shortage cost can be the most arbitrary. Holding costs and ordering costs can usually be calculated using accounting cost data. The cost of a lost sale from a shortage cannot be easily determined since whether the sale is really lost or not can be debated. There may be longer term effects from a permanent loss of a customer.

Total costs. The total inventory cost at any given order quantity is the sum of the carrying costs and the ordering costs. The lowest total cost occurs at the point where the carrying cost line and the ordering cost line intersect. A variety of mathematical formulations exist to determine the least total cost under different circumstances. We shall explore the use of one such method later in this chapter. Suitable sources on such additional techniques should be consulted for more information.

Establishing Inventory Priorities

A final requirement for an effective inventory management system is the inclusion of a set of priorities. Given the limited resources available to management (time), it is not possible to give full and equal attention to each item maintained in inventory. Thus, a ranking or priority system should be used. The more important items (as measured in dollars of usage) receive the most attention. This is the nature of the ABC system of inventory control. Typically 15-20% of the items in inventory account for 75-80% of the dollar value of inventory usage. It is these A items to which most of management's attention in iventory control should be directed.

A tight degree of control requiring accurate record keeping would be used for type A items. Management would continuously review the inventory status of A items. At the other end, C items would receive infrequent management attention with a relatively loose control system consisting of simple record keeping. B items would be in a middle range. It should be noted that this is an arbitrary classification system. Non-financial factors need also be considered, such as the treatment of items of critical nature (e.g., the 29¢ bolt without which the vehicle cannot be operated). Also, items which are difficult to store or require special handling (those which are bulky or subject to deterioration) may need to be considered outside of an ABC approach. An ABC system recognizes the limited resources of management time. An attempt is made to focus management's attention on the most important items in inventory.

Economic Order Quantity (EOQ)

In considering the costs associated with maintaining items in inventory, it is necessary to recognize that trade-offs must be made between the different cost components. For example, by placing only one order per year we could accomplish a low annual ordering cost. However, in this single order we would receive inventory items that would not be used for close to one year. This action creates a high holding cost because of the storage costs and the opportunity costs associated with tying money up for such a long period of time. Similarly, by only ordering enough to meet demand for a short period of time (e.g., one week), we could reduce total holding costs. However, more orders would have to be placed (52 per year) and this increases the ordering cost. It is possible to determine what size order to make and how often to make the orders with sufficient cost and usage information.

For any given inventory problem, total cost calculations could be performed for several alternative ordering strategies, depending on the size and frequency of each order. The following equations can be used to determine the carrying cost and the holding cost of each alternative. The sum of the two costs gives the total cost for each ordering strategy. We assume that the annual demand, annual holding cost per unit, and ordering cost are known. Selecting the number of orders to be placed per year allows you to determine the number of units per order.

The equations:

$$\text{Carrying cost} = \frac{Q}{2}(H)$$

$$\text{Ordering cost} = \frac{D}{Q}(S)$$

$$\text{Total cost} = \frac{Q}{2}(H) + \frac{D}{Q}(S)$$

The terms:

D = Annual demand in units

H = Holding cost per unit

S = Order cost

Q = Order quantity

Rather than perform the above calculations for each possible ordering strategy and selecting the one with the lowest total cost, we can use a technique known as the Economic Order Quantity (EOQ) formula. The EOQ formula will determine the point (order quantity) at which the total cost is minimized. The EOQ formula follows:

$$Q^* = \sqrt{\frac{(2)(D)(S)}{H}}$$

where Q^* = optimal order quantity

D = Demand in units

S = Cost of placing an order

H = Carrying cost of a single unit

The EOQ formula provides the order quantity which minimizes the total cost. As can be seen from Figure 5.1, this will occur at the point where the carrying cost and order cost lines intersect.

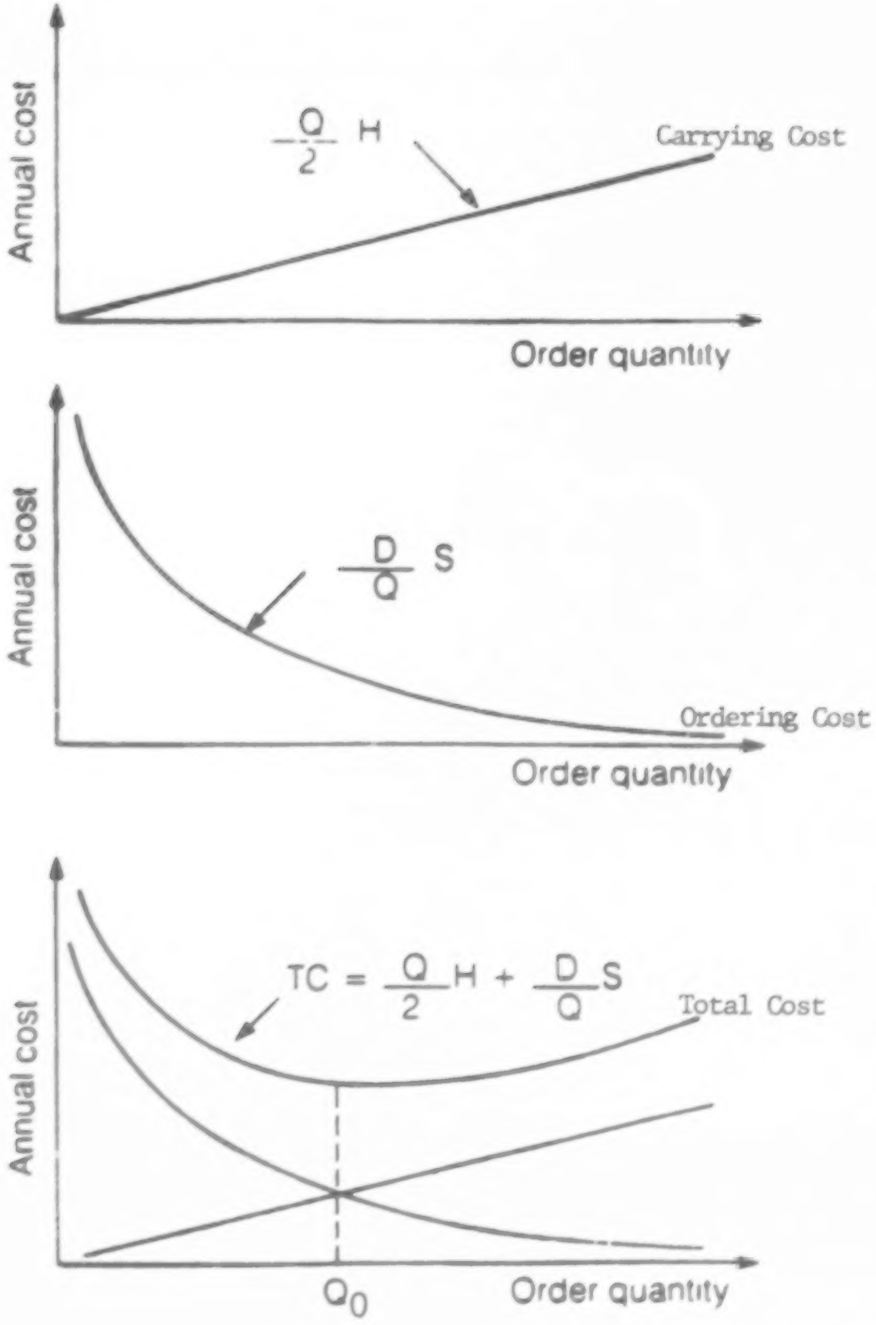


FIGURE 5.1 Carrying cost, ordering cost, and total cost curves.

There are a number of assumptions in the EOQ formula:

1. Total number of units (demand) is known with certainty.
2. Demand is constant (steady usage rate during subject period).
3. Orders are received instantly (this can be modified by increasing the lead time).
4. Ordering costs are the same regardless of order size.
5. Purchase price does not fluctuate during the period, but the price can vary as a function of order quantity.
6. Sufficient resources (space, handling capacity, and money) are available to allow purchase of any quantity desired.

It is possible to relax some of the above assumptions and modify the EOQ formula for use in such situations which do not meet the assumptions.

A simplified example using the basic assumptions follows.

Annual demand = D = 1250 units

Ordering cost = S = $5 per order

Carrying cost = H = $.20 per unit per period

The EOQ for this example would be found by:

$$
\begin{aligned}
Q^* &= \sqrt{\frac{(2)(D)(S)}{H}} \\
&= \sqrt{\frac{(2)(1,250)(5)}{.20}} \\
&= \sqrt{\frac{12,500}{.20}} \\
&= \sqrt{62,500} \\
&= 250
\end{aligned}
$$

The result is an EOQ of 250 units, meaning that when necessary an order of 250 units would be placed. The total number of orders per year would be:

$$\frac{D}{Q} = \frac{1250}{250} = 5 \text{ orders per year}$$

The total cost would be:

$$\begin{aligned}\text{Total cost} &= \frac{Q}{2}(H) + \frac{D}{Q}(S)\\ &= \frac{250}{2}(.2) + \frac{1,250}{2}(5)\\ &= 25 + 25\\ &= 50\end{aligned}$$

Quantity Discount Example

A common business practice is to allow discounts on quantity purchases of a product. The availability of different prices for a product means that an EOQ calculation and analysis of the total cost involved should be performed for each price offering.

Assume that your fuel supplier charges a base rate of \$.80 per gallon and \$.75 per gallon for purchase quantities above 6500 gallons. Fuel consumption is 200,000 gallons per year with usage spread out uniformly during the year. It costs the transit property \$10 to place an order and the current interest rate is 12 percent. In order to determine whether or not the transit property should take advantage of the volume discount price, we need to perform an EOQ calculation for each circumstance.

$$\begin{aligned}Q^* &= \sqrt{\frac{(2)\ (200,000)\ (10)}{(.12)\ (.80)}}\\ &= \sqrt{41,666,666}\\ &= 6,455\end{aligned}$$

At a price of \$.80 per gallon we should purchase fuel in batches of 6455 gallons at a time. This would result in 31 orders per year.

$$Q^* = \sqrt{\frac{(2)\cdot(200{,}000)\cdot(10)}{(.12)\cdot(.75)}}$$

$$= \sqrt{44{,}444{,}444}$$

$$= 6{,}667$$

As Q^* = 6,667 and this amount is greater than the 6,500 gallon minimum, the transit property should buy 6,500 gallons of fuel per purchase. Orders would be placed 30 times per year.

We can also determine the annual cost of both ordering policies. The calculations for the policy of purchasing fuel at \$.80 per gallon are presented below. A similar set of calculations would also be done for the \$.65 per gallon alternative.

The total annual fuel purchase cost would be \$160,000 (200,000 gallons at \$.80 per gallon). The annual ordering cost is simply the number of orders placed per year multiplied by the cost per order:

31 orders * \$10 per order = \$310

Given an order quantity of 6,455 gallons we can find that 31 orders per year (200,000 gallons/6,455 gallons = 30.98) would have to be made. Each order would last approximately 12 days (365 days per year/31 orders per year). We are therefore able to calculate an annual holding cost (rounded) for this approach

$$\left(\frac{6{,}455 \text{ gallons}}{2}\right)(\$.80) * (.12)\left(\frac{12}{365}\right) * \left(\frac{31 \text{ orders}}{\text{per year}}\right) = \$316$$

The respective costs of the two strategies are:

Purchase cost	\$ 160,000	\$ 150,000
Order cost	310	300
Holding cost	316	296
	\$ 160,626	\$ 150,596

The main difference between the two strategies involves the \$10,000 savings due to the 5¢ gallon price differential. Due to the effects of rounding during the several steps of each calculation, the ordering cost and holding cost are not exactly equal.

rounding during the several steps of each calculation, the ordering cost and holding cost are not exactly equal.

CHAPTER SIX

RISK MANAGEMENT

Elements of Risk Management

Risk management is a planned approach to protecting the assets of a transit property from accidental losses at minimum cost. Risk is the possibility, chance, or uncertainty of loss. Risk management is only concerned with pure risks as distinguished from speculative risks; pure risks involve only the chance of loss or no loss, and speculative risks such as gambling include the chance of gain as well as the chance of loss. Risks are caused by perils and hazards--a peril is a cause of a loss; a hazard is a condition that may create or increase the chance of loss arising from a given peril. For example, a fire is a peril and a careless employee is a hazard.

Individuals, businesses, and public entities face a number of pure risks, including personal risks, property risks, and liability risks. Personal risks pertain to the possibility of loss of income or assets as a result of the loss of ability to earn income. Earning power is subject to a number of perils, including premature death, superannuation (living too long), sickness or disability, and unemployment.

Property risks include three types of losses: (1) loss of property through damage or destruction by such perils as fire, wind, or explosions; (2) loss of possession of property by such perils as theft, burglary, or robbery; and (3) indirect or consequential losses such as loss of income as a result of a direct property loss and extra expenses required to continue providing services as a result of a direct property loss.

Liability risks involve the possibility of loss of income rising from liability for (1) bodily injury and property damage of others as a result of negligence or carelessness (unintentional torts); (2) infringement on the rights of others, such as assault and battery, libel, slander, or false arrest (intentional torts); and (3) contractual obligations. While the risk manager may be responsible for the employee benefits program relating to some personal risks, risk management is primarily concerned with property and liability risks.

A risk management program is comprised of five basic elements: (1) risk identification, (2) risk evaluation, (3) risk control, (4) risk funding, and (5) risk administration. While each element is important to ensure the success of the program, the risk management decisionmaking process primarily relates to ways in which risks may be handled or treated. The methods for handling or treating risks include avoidance of risk, reduction of risk, retention of risk, and transfer of risk. Since the elements of risk control and risk funding concern decisions on handling risks, these two elements define most of the efforts of the risk manager.

Risk Identification

The first step in the risk management process is identifying exposures to accidental loss faced by the transit property. These exposures must be identified before any decisions can be made concerning appropriate risk handling or treatment methods. Failure to identify loss exposures can result in unplanned assumption or retention of losses that may occur. Many tools are available to identify loss exposures, including checklists or questionnaires, records of various types, interviews and inspections, and flow charts.

Insurance-related publications may include checklist or questionnaire forms. The checklist matches various types of risks and perils with appropriate insurance coverages. Questionnaires have been designed to elicit information on various aspects of the organization such as assets, liabilities, operations, and personnel. While a useful starting point, checklists and questionnaires must be supplemented with other tools which provide information specifically related to a particular mass transportation provider's situation.

Records of various types, such as budgets, financial statements, loss records, contracts, and property records assist in identifying various loss exposures. Interviews with organizational personnel and inspection of the facilities are also useful. A flow chart of the process by which transit service is provided and vehicles are serviced and maintained may alert the risk manager to where and how certain loss exposures exist.

Risk Evaluation

Risk evaluation involves efforts to measure the frequency or probability of losses and the severity or size of losses. Loss records for the previous five years are essential in determining the types of losses that have occurred and the frequency and severity of those losses. While loss records alone are seldom sufficient to project the frequency and severity of future losses with a high degree of precision, they do provide useful guides in choosing appropriate risk handling or treatment methods.

In addition to projecting probable frequency and severity of losses, the possible or potential severity of losses which can be catastrophic in nature must also be estimated. Loss records are not particularly useful in this case. Both internal and external data sources, such as property valuation records and liability judgments by courts and juries, can assist in setting the potential severity of a catastrophic loss such as property destruction or a liability suit against the transit agency.

Through the use of loss records and other internal and external information, the transit risk manager can categorize risks in terms of their frequency and severity and the effect of losses on the financial capacity of the transit property. This analysis is particularly important to decide the appropriate risk funding mix of retention and purchase of insurance.

Risk Control

Once risks have been identified and evaluated, they need to be treated or handled. As stated earlier, the four ways to handle risks are: (1) avoidance of risk, (2) reduction of risk, (3) retention of risk, and (4) transfer of risk. Risk control concerns efforts to avoid or reduce risk. Avoidance of risk is simply not undertaking a program or service which creates the risk. Reduction of risk concerns efforts to prevent the chances of a loss (i.e., loss prevention) and to minimize the severity of a loss once it occurs (i.e., loss control). Efforts such as safety programs, fire protection, and security measures are integral aspects of risk control. The transit industry has a history--dating to the 1920s--of safety incentive programs for transit operators. Trophies and awards are typical forms of recognition. In recent years, the federal government has sponsored programs through the Urban Mass Transportation Administration (UMTA) in driver training and safety training for bus operators.

Risk Funding

Risk funding involves establishing the capacity to pay for losses. This includes risk treatment by either retaining the risk or transferring the risk. Under risk retention, a transit system funds its risks by assuming responsibility to pay for part of or all the loss. Under risk transfer, a transit system funds its risks by purchasing insurance to cover its losses. Risk can also be transferred by the use of an indemnity or hold-harmless clause in various contracts.

Risk Administration

Risk administration concerns the development of the administrative capacity to carry out the risk management process. It primarily entails policy, structures, and records and procedures.

Risk Funding and Decisionmaking

While risk control through avoidance and reduction is essential, risk management decisionmaking is principally concerned with deciding the proper mix between retaining risk with the transit agency and transferring risk to an insurance company through the purchase of insurance.

In the risk management process, the order of consideration for ways to handle risks identified and evaluated is avoidance, reduction, retention, and transfer. The practical value of risk control through avoidance is its implications for management concern about the costs and benefits of undertaking a new activity, program, or service; it is seldom a viable alternative for handling risks. While the nature and extent of risk reduction efforts depend somewhat on the risks involved, loss control and loss prevention programs should always be present. Accordingly, risk management decisionmaking primarily centers on risk funding through retention and transfer.

Risk Retention

Risk retention entails the funding of risks by assuming the responsibility to pay for a portion of or all losses of a transit agency. Often called assumption or self-insurance, retention is not usually used to retain the entire risk unless the risk is inconsequential in terms of its financial impact. In addition, retention decisions are assumed to be planned by the transit provider; unplanned retention results from not properly identifying risks or from lack of a management decision concerning which risk handling method to use. One justification for developing a risk management program is the prevention of unplanned retention of risk.

Benefits of risk retention. One important benefit of risk retention is cost savings compared to the purchase of insurance. Insurance companies generally collect from $1.50 to $2 in premiums for every dollar spent in claims. This additional charge is used to cover costs of the insurance company over and above projected losses, including overhead, commission, taxes, and profit. While a portion of these costs savings may have to be used by the transit system to pay for claims services previously included in the insurance premiums, the net savings is still substantial.

A second benefit of risk retention provides an incentive for loss prevention and loss control efforts, that is, the direct relationship between cutting losses and cost savings. While a good loss experience can result in reduction of insurance premiums, the relationship is not a direct one. The underwriting process used to establish an insurance rate for a transit system includes factors other than the particular loss experience of the transit system. A bad loss experience usually adversely affects the insurance rate more than a good loss experience positively affects the insurance rate. This is particularly true in transit systems without risk management expertise to negotiate lower insurance rates for a good loss experience and to implement proper loss prevention and loss control programs where a bad loss experience exists.

Finally, risk retention allows for more management discretion and control in making some risk management decisions. The transit provider has more options in selecting claims, loss prevention, and loss reporting services it needs. When losses are retained instead of insured, transit management is in a better position to fight what it considers to be unjust claims.

Types of retention. Retention can take many forms depending on the retention instrument, its size, its relationship to insurance coverages, and the budget mechanism for funding retained losses. However, the various names given to retention plans is confusing to the laymen and often obscures the fact that retention is either pure or total, or includes the use of a deductible.

1. Pure retention. Pure or total retention is the payment for all losses of a particular type, with no insurance purchased at all. Pure retention is seldom used for all risks but is rather used for specific risks. For example, within the general area of property risks, exposure to loss of money and securities may be retained totally in lieu of purchasing insurance with or without a deductible.

2. Deductible. Retention through the use of a deductible always includes the insurance mechanism. The major type of deductible in the property and liability fields is the flat or straight deductable. For each loss, the transit system is responsible for payment up to the defined deductible amount. The portion of the loss greater than the deductible is paid by the insurance company.

Other common types of deductibles include the annual aggregate, disappearing, and waiting period. For example, if a transit system has a straight deductible of $25,000 per loss with a $100,000 annual aggregate deductible, it will pay the first $25,000 of each loss subject to a maximum annual aggregate of $100,000. The annual aggregate deductible is normally used with the straight deductible. With a disappearing deductible, the transit entity retains all losses up to a straight deductible. For losses above this straight deductible, the amount of retention gradually disappears. With a waiting period deductible a specific amount of time lapses after a loss before the deductible is utilized.

3. Pooling. One innovative approach using the retention mechanism is the concept of "pooling"--several public transit agencies joining together to handle risks of accidental loss on a group basis. The typical pool consists of (1) a level of retention by each transit agency, (2) a level of retention by all transit agencies as a group, and (3) a level of catastrophic insurance coverage where losses exceeding the upper limit of the pool's collective retention are

handled through the purchase of excess insurance coverage. The benefits of pooling are large cost reductions, broader coverage and protection, and improved risk management administration.

Risk Transfer Through Insurance

From the risk management perspective, risk transfer through the purchase of insurance is the last method considered for the handling of risk. At the same time, insurance is an integral part of the risk management program. While a detailed explanation of the insurance and ratemaking process is beyond the scope of this chapter, understanding a few basic concepts is necessary in order to understand the potential of risk management for reducing costs.

Insurance has two essential characteristics: (1) the transferring of risk from one individual, business, or public entity to a group; and (2) the equitable sharing of losses by all members of the group. Insurance provides a mechanism for an individual, business, or public entity to substitute a small certain cost, the premium, for a large uncertain financial loss. The insurance company bases its rates charged to insureds on predictions about future losses. For the insurance company, the risk or the possibility of financial loss is measured by the potential deviation of actual from prelisted results. The ability to make accurate predictions requires a sufficiently large number of homogeneous exposure units. The use of probability theory and statistical techniques are imperative to make statistically valid predictions. Insurance statistical organizations and rating bureaus provide necessary data to make such predictions.

A rate is the price charged for each unit of protection or exposure and is based on a prediction of the expected value of future losses which in turn are measured by frequency or how often and severity or how large. Based on a sufficiently large body of data from past experience, the insurance company predicts the expected value of future losses, or the average number of losses (frequency) and the average size of losses (severity). An exposure unit is the fundamental measure of loss potential and is used to compute probability of loss and cost of premium; it varies among lines of insurance and even from class to class within a particular line of insurance. In fire insurance, the exposure unit is $100 of insurance coverage; in workers' compensation it is $100 of payroll.

A premium is the rate multiplied by the amount of desired insurance coverage. The premium charged an insured must be large enough to cover predicted losses and expenses of the insurance company. The insurance company then allocates these costs of predicted losses and expenses among the various classes of insured. The part of the rate charged an insured to cover predicted losses is called the pure premium when expressed in monetary terms and the expected loss ratio when expressed as a percentage of losses to premiums. In addition to paying for losses, the rate must reflect the costs to the insurance company of doing business. The part of the rate going for expenses is called loading, and includes such costs as commissions and other acquisition expenses, administrative expenses, premium taxes, allowances for contingencies, and profits.

Risk Decisionmaking

While the risk management process requires a number of decisions, the advantages of developing a risk management program primarily accrue as a result of its structured approach to deciding on how best to handle or treat risks faced by the mass transportation provider. In particular, these decisions primarily relate to risk funding, alternatives of risk retention, and risk transfer through the purchase of insurance.

A useful approach to understanding the appropriate use of various risk handling or treatment methods is the frequency-severity matrix (see Figure 6.1) which provides general guidelines and a basic framework for risk handling decisionmaking. Conclusions drawn from understanding the implications of this matrix, coupled with specific data for a particular transit provider, provide the means to decide how best to handle the risks faced by a particular transit system. Specific data or information include past loss experience to project probable frequency and severity of losses, internal and external data sources for projecting potential severity of losses, and financial data for projecting the financial capacity for retaining losses.

Before the four frequency and severity combinations are analyzed for their implications on how best to handle risks, considering each separately provides general guidelines for viewing the economic advantages and disadvantages of retention versus transfer through the purchase of insurance. These guidelines can then be adapted to meet the various frequency and severity combinations.

Frequency of Risk

Severity of Risk	Low	High
Low	retention	retention reduction
High	transfer	avoidance reduction

FIGURE 6.1 Frequency/severity matrix: recommended guidelines for handling risk.

The higher the frequency or probability of loss for a certain type of risk, the less economical is the purchase of insurance. As noted above, the portion of the insurance rate charged for the payment of losses is based on a prediction by the insurance company of the expected value of losses--the higher the frequency of loss, the higher the probability of a loss occurring. The transit system purchasing insurance for protection against risks with a high probability of loss is paying for losses that are relatively certain to occur plus the expenses of the insurance company.

The higher the severity or size of a loss for a certain type of risk, the greater is the financial impact on the transit system if such a loss should occur. The insurance mechanism is appropriate where the system can substitute a relatively small, certain premium cost for the uncertainty of a large financial loss.

High frequency and high severity risks are best handled through avoidance and reduction efforts. With loss control and loss prevention programs, the potential severity or frequency of loss may be lowered to an appropriate level. If reduction efforts are not possible or involve costs deemed greater than avoiding the risk, avoidance should be chosen. The high frequency of loss implies that insurance is too expensive, while the high severity of loss implies that retention is not possible given the catastrophic effects of a large loss on the financial capability of a public transit system.

The purchase of insurance is most expensive and least called for when the frequency or probability of loss is high and the severity of a loss is low. The high frequency implies high predictability while low severity implies inconsequential financial effects on the transit system. The premium paid by a transit property would fund highly predictable losses having little financial impact on the property itself plus the expenses of the insurance company.

Risk retention should be used for risks exhibiting high frequency and low severity of loss characteristics. In addition, reduction efforts are necessary to lessen the frequency of loss. Since these risks are retained, any efforts to reduce the frequency of loss directly affect the extent of losses retained by the transit property. Risks characterized by low frequency and low severity of loss should also be retained. Losses do not occur often, and when they do, their financial effects are minimal.

The purchase of insurance is most appropriate for low frequency and high severity risks. A low frequency or probability implies a low expected value predicted by the insurance company and a catastrophic financial impact on the public transit entity if a loss should occur. Because the expected value of loss is low, the cost of transferring the risk through the purchase of insurance is low given the catastrophic financial effects of a potential loss. Low frequency and high severity risks most clearly define the role of insurance in substituting a relatively small certain premium cost for the uncertainty of a large financial loss.

The frequency-severity matrix provides general guidelines and a basic framework for decisions concerning the handling of various types of risks. As such, it should be viewed as a general approach for visualizing the risk decisionmaking process. Risk retention and risk transfer through the purchase of insurance are seldom mutually exclusive in their actual application. The purchase of insurance is considered last as a risk handling alternative because a cost is included in transferring risk to an insurance company, including the expenses of the insurance company to handle the account of the transit system for the risks that are transferred. The objective of transit management is to retain as much risk as it financially can and to transfer the remaining risk to an insurance company. Without minimizing the role of risk avoidance, risk transfer by other means such as contractual transfer through indemnity or hold harmless agreements, and, in particular, risk reduction efforts, risk decisionmaking primarily concerns the appropriate mix of risk retention and risk transfer through the purchase of insurance.

Given decisions on the type of risks to be retained and the type of risks to be transferred to an insurance company, consideration needs to be given to the amount and funding of risk retention. One rule of thumb widely recommended as a starting point for consideration is that a public transit system should be able to retain one-tenth of 1% (.1%) of the operating budget for any one loss or occurrence, and that 1% of the budget should be allocated for all losses in an annual period. For any particular transit system, the suggested retention level can be higher or lower, depending on its financial capability, loss experience, and loss reduction efforts.

The most common approach to funding losses within the retention level is through expensing losses in the budget, establishing a funded reserve, or a combination of both. The structure and management of a reserve fund as well as the objectives it serves should be carefully considered by a transit agency implementing a risk management program characterized by much higher retention levels than existed previously.

Property Insurance Coverages

Each of the three distinct lines or types of insurance--property and liability, life, and accident and health--are conceived for specific types of risks faced by individuals, businesses, and public entities. Most public transit systems are concerned about their employee benefits program concerning individual accident and health risks, but risk management is primarily concerned with risks faced by the transit property as a public entity rather than individual risks of its employees.

Within the general category of property insurance are various types of specific coverages relevant to particular types of property, perils or hazards, and risks. The objective is to purchase appropriate types and limits of insurance coverage at minimum cost. Understanding insurance coverages and the risk management process provides transit management the capacity to decide the appropriate mix of insurance and retention.

Fire and Allied Lines

All public transit systems own and use real and personal property which can be damaged or destroyed from a variety of perils. The basic reference point for understanding property insurance covering these risks is the Standard Fire Policy: with the exception of minor variations in a few states, the policy wording of the Standard Fire Policy is the same across the country covering direct damage or destruction of property from the perils of fire, lightning, and removal of property from the premises endangered by fire and lightning.

The extended coverage endorsement is a common addition to the fire policy for protection against nine additional perils as a group for a single premium charge. These perils include windstorm, hail, explosion, riot, riot attending a strike, civil commotion, aircraft, vehicles, and smoke. The fire policy often is endorsed to include vandalism and malicious mischief as well as the extended coverage for the nine additional perils, and for an additional premium charge, protection is provided against the willful and malicious damage to or destruction of property. Protection is not provided for damage to glass as a result of vandalism, nor for loss from theft, burglary, larceny, or pilferage, nor does the vandalism and malicious mischief coverage apply if the insured building has been vacant for over 30 days.

Exclusion. The above coverage excludes protection for certain specified property and perils which may be insured under other policies if desired. In addition to specified exclusions, exclusion is implied for perils not specifically named in the policy. Important property exclusions include destruction of money and securities and limitations on the coverages of records and files to their physical value. Some important peril exclusions specifically named or implied include damage caused by the explosion of steam boilers and pipes, flood, and earthquakes. Coverage to include these and other excluded property and perils is available through an all-risks policy provided by endorsement or by a separate insuring agreement, or a separate policy related to a specific type of coverage. The all-risk policy includes all risk of physical loss except as specifically excluded in the policy. Because the sources of loss are many and varied and are at times difficult to determine, an all-risk policy is important. The coverage of the risk to equipment--buses or other revenue and non-revenue vehicles--stored in a garage or maintenance facility is especially important in transit, because such equipment may far exceed the value of the structure itself. Separate policies relating to a specific type of coverage which provide all-risk protection include money and securities broad form, valuable paper policy, accounts receivable policy, and the boiler and machinery policy.

Since the money and securities broad form and boiler and machinery policy are not classified in the category of fire and allied lines, they are discussed elsewhere in more detail. A valuable paper policy covers the cost to reproduce the paper, including research, reconstruction, and other costs; valuable papers might include books, deeds, manuscripts, mortgages, abstracts and so on. An account receivable policy provides protection against the inability of the insured to collect amounts owed it because of the destruction of records, including sums owed, interest charges on loans taken out by the insured to offset impaired collections, above normal collection expenses, and expenses to reconstruct the records. Loss prevention through maintenance of duplicate sets of records and fire safety protection are essential.

Coinsurance. Most fire and extended coverage policies contain a coinsurance clause which requires the insured to carry insurance equal to a certain percent of the total value of the property. This "insurance-to-value" requirement is related to equity in fire rates. Most property losses are partial. Fire insurance rates are based on the ratio of losses to the total insured values, thus the rate declines as the amount of insurance expressed as a percentage of property values increases. The normal coinsurance percentages are 80%, 90%, and 100%. If, at the time of loss, the insured fails to carry the required level of insurance, the amount of loss paid by the insurance company is reduced. For example, if a building is valued at $200,000 and coinsurance of 80% is required, the insured must have insurance equal to $160,000 at the time of loss to be fully covered up to $160,000 limit of coverage. If the value of the building increases to $250,000 as time goes by and the insured maintains $160,000 of insurance, a penalty will be assessed in case of a loss. If a $50,000 fire loss occurs, the insured would receive the following:

$$\frac{\text{Amount of insurance carried}}{\text{Amount of insurance required}} \times \text{Amount of loss} = \text{payment}$$

$$\frac{\$160{,}000}{\$200{,}000\ (80\% \times \$250{,}000)} \times \$50{,}000 = \$40{,}000$$

Maintenance of regular updates of property values are extremely important in order that the insured carries the proper amount of insurance. The coinsurance requirement applies to the value of the property at the time of loss and not when the insurance was purchased. Property value increases should be reflected by changes in the policy limits. Policies with coinsurance clauses should be endorsed with an agreed amount endorsement in which the insurance company will not apply the coinsurance penalty, that is, the company agrees that the values stated are adequate to meet its coinsurance requirement.

Value basis. The fire policy provides coverage on an actual cash value basis that, not defined in the policy, is generally considered to be the replacement cost minus depreciation. The policy can be endorsed to include payment on a replacement cost basis. This includes payment to repair or rebuild with materials of like kind and quality without any deduction for depreciation. Replacement cost coverage is particularly important for newer buildings in which little depreciation has occurred. Generally, with the exception of old and functionally obsolescent or inadequate buildings, the replacement cost basis is preferred.

Indirect loss coverages. The fire policy only covers direct damage by the perils specified in its policy. Indirect or consequential damage protection can be obtained by endorsement or in a separate policy. The principal areas of consequential loss coverages are loss of revenue and extra expense coverages. The loss of revenue and the extra expense to continue operating services as a result of direct damage to certain property can be significant in a transit system.

Difference-in-conditions policy. A difference-in-condition policy (DIC) is a special form of all risk coverage usually used in conjunction with separate policies covering against fire extended coverage, and vandalism and malicious mischief. The DIC policy provides coverage for risks of physical loss not covered by these separate policies. It provides the insured protection against additional perils such as flood, earthquakes, water damage, and collapse. The insured can structure the DIC policy to cover the particular property risks it faces which are not covered by other property policies.

Boiler and Machinery

The explosion or breakdown of steam boilers, pressure containers, electrical equipment such as generators, turbines and motors, refrigerated equipment, and others are not covered by other property policies. A boiler and machinery policy is sometimes purchased because of the inspection and loss prevention services provided by the insurance company. Coverage may be limited form or broad form. Limited form applies to protection against explosion only. Broad form includes loss by cracking, building, or breakdown as well as loss by explosion. In addition, coverage may include consequential or indirect damage as well as direct damage.

Automobile Physical Damage

The auto policy purchased by the insured includes both property and liability coverages. Since most of the auto policy is related to liability coverages, the policy as a whole will be discussed in the next chapter. The only property coverage of the auto policy is automobile physical damage insurance. Available coverages include (1) comprehensive coverage for virtually all risks of loss other than collision or upset, (2) collision, and (3) specified or named perils selected by the insured.

Employee and Nonemployee Crime

The loss of possession of property is a property risk related to various crime coverages. Fidelity bonds are the means to protect a transit agency against loss resulting from the dishonesty or criminal acts of its employees. In the transit industry, such instruments are generally used only for employees who have direct cash-handling responsibility. In addition, these bonds may cover the negligence or failure of employees to perform their duties faithfully.

Nonemployee crime coverage protects against loss of possession of property through the dishonest act of nonemployees. These coverages are classified by the type of peril insured against. Various policies relate to burglary, robbery, thefts, forgery, and others. The money and securities broad form provides all risk coverage on money, securities, and similar property.

Liability Insurance Coverages

Liability risks exist for any activity that may result in injury to another or damage to the property of others. This liability may take the form of unintentional torts resulting from negligence or carelessness; intentional torts such as libel, slander, trespass, invasion of property, and others resulting from infringing on the rights of others; or contractual liability resulting from indemnity, or hold harmless agreements specified in contracts. In addition, liability may be statutorily based, but these statutes usually relate to levels of property damage and bodily injury arising from investigational torts.

Liability risks are particularly important because of their catastrophic nature. Legal awards for damages have been skyrocketing and projecting future awards is difficult. Until the last few decades, public entities were immune from liability based on the doctrine of sovereign immunity. The doctrine was based on a common law--"the king can do no wrong." Increasingly, through state statute and judicial decisions, public transit entities are being held responsible for their actions. Liability insurance can be divided into the classification of automobile and vehicle liability, employer's liability and workers' compensation, and general liability.

Automobile Liability

The single automobile insurance contract has four types of insurance coverages. First, automobile and vehicular liability insurance protects the public entity against loss from legal liability arising from ownership, maintenance, or use of owned, leased, hired, or nonowned (all other motor vehicles, such as use of employee's auto for business purposes) vehicles. A second type of coverage is medical payments for bodily injury losses. Medical liability is an optimal coverage which will pay up to the stated limit regardless of whether the transit system is negligent. A third type of coverage is physical damage protection against losses of the transit system's vehicles. Since it is properly considered a property coverage, it was discussed in Chapter Five. The fourth type of coverage is uninsured motorists which protects employees and other occupants of transit vehicles for bodily injury damages when the accident is caused by a hit-and-run driver or a driver without liability insurance.

Several insurance companies provide special insurance for transit vehicles which is similar to a standard automobile policy. The types of automobile policies are the basic automobile policy, business automobile policy, and the comprehensive automobile policy. The business auto policy or comprehensive auto policy provides the best coverage. The business auto policy provides flexibility in terms of coverages, but it is usually used to provide the same type of protection as the comprehensive auto policy. The use of the comprehensive auto policy, and in most cases the business auto policy, is to provide liability coverage for property damage and bodily injury arising from the ownership, maintenance, or use of any automobile, including owned, hired, and nonowned automobile. Under the basic automobile policy, hired or nonowned automobiles are not covered although they can be added to the policy. The basic automobile policy also requires newly acquired autos to be reported to the insurance company within 30 days. Coverage does not apply if they are not reported. Under the other two policy forms, coverage for newly acquired autos automatically applies.

Workers' Compensation and Employees' Liability

Each state has its own workers' compensation laws which define loss of wages and medical care benefits to be paid a public employee. The workers' compensation coverage and the policy only differ generally by the relevant state statute. The employers' liability coverage of the policy provides protection against third party claims and is automatically included with the workers' compensation coverage, but the two are distinct. The workers' compensation coverage applies only to statutory obligation found in the state workers' compensation law, and the employers' liability coverage only applies to suits brought against the public entity by the workers' spouse or other third party under common law. Employees' liability covers bodily injury claims which do not fall under the workers' compensation law.

General Liability

General liability concerns common types of liability exposures. The basic general liability policy is the comprehensive general liability (CGL) policy that automatically covers newly acquired exposures developed during the policy period. The basic coverages of the CGL policy which are automatically included as part of the coverage include (1) liability arising from the ownership, maintenance, or use of premises owned, leased, rented, or occupied by the transit agency, and liability resulting from the conduct of business operations on or off the premises; (2) liability resulting from products or services sold, handled, or distributed to others and liability arising from work performed, completed, or abandoned; (3) liability for work performed by independent contractors on behalf of the public entity; and (4) liability for certain "incidental contracts" including lease of premises agreement, assessment agreement, agreements required by municipal ordinance except in connection with work for the municipality, railroad sidetrack agreements, and elevator maintenance agreements.

The CGL has a number of important exclusions. Contractual liability is limited to incidental contracts. To obtain coverage for other types of contracts which may arise, blanket contractual liability coverage can be purchased. Damage to property in the custody or control of a public transit system is excluded. Important exposures to loss not covered would include leased buildings, machines, computers, or other equipment. Other coverages may be available to handle particular exposures to loss which exist. Other exclusions include liability resulting from owned or hired automobile or vehicle, aircrafts, and watercrafts; liability for property damage arising from explosion for some operations; collapse for certain operations; and damage to underground property resulting from the use of maintained equipment. Liability for selling or serving liquor in violation of the law is also excluded. Finally, liability arising from pollution or contamination is excluded.

Other liability coverages are available through endorsement to the CGL or by separate policies. The CGL provides protection against liability arising from unintentional torts. It does not provide protection against liability arising from intentional torts such as libel, slander, and others. Personal injury liability can be purchased separately or endorsed onto the CGL to cover personal injury which occurs from intentional torts.

Errors and omissions coverage can be purchased to protect elected and appointed officials from claims alleging mismanagement and lack of professional accountability. Public officials have been held increasingly responsible for their actions by the courts. The potential exposures to loss are only limited by one's imagination. The errors and omissions liability policy differ widely in their exclusions and provisions. The policy needs to be carefully studied and must reflect the specific concerns of a public transit system.

One of the most important insurance coverages is the umbrella liability policy. This provides excess liablity coverage over underlying primary coverages and additional coverage not provided by the primary coverages. When the umbrella provides additional coverage, a sizeable self-insured retention or deductible is required. No standard umbrella policy form exists, therefore, the coverage needs to be carefully examined. The minimum limit is $1 million and higher limits are available in multiples of $1 million. If the umbrella is "following form" in nature, and it should be, the coverages, conditions, and provisions correspond to the first layer or primary coverages. However, care must be taken to ensure that the primary coverages meet the needs of the transit system in terms of adequate coverage. Any coverage problem with the primary policy will be compounded by the "following form" umbrella policy.

Establishing A Risk Management Policy

To perform the position's tasks successfully, the risk manager must have the support of top management and the governing body; in the PTCs, this means the general manager and the board of directors, and in cities having mass transit departments or utilities, this means the mayor and city council members. The chances of success of a risk management program is directly related to the level of importance and support assigned to the program by top management and the governing body. Through the involvement of top management and the governing body, a clear statement of the importance of the risk management program and support for the implementation of the risk management program is made. In this way, the risk manager is assured of the support and direction necessary to carry out responsibilities of the position.

Policy Statement

An important element of the risk management program is the establishment of a risk management policy statement. Normally, the risk manager develops the initial draft of the policy statement for review by top transit management and the governing body. Since risk management is a technical, complex, management function, the risk manager must provide information to top management and the governing body through various alternatives and their implications. At the same time top management and the governing body should express their ideas and concerns. To apply successfully the policy that is approved, top management and the governing body must have more than a casual understanding of risk management; they need to know the underlying philosophy of the policy statement. These initial discussions among the risk manager, top management, and the governing body, prior to preparation of the initial draft policy statement, will assure a common understanding among all parties involved. In some cases, top management and, in particular, the governing body will want to see the initial draft policy statement before they provide any input.

A formal, written, risk management policy statement should address goals or purposes of the risk management program, scope of authority and responsibility of the risk manager and his relationship to others in the organization, and guidelines on such issues as the level of risk retention and funded reserves. The following sample risk management policy statement could serve as a guide, recognizing that changes would need to be made to fit the specific needs of a particular transit system.

Risk Management Goals

The transit system's policy with respect to the management of all risks of accidental loss such as fire, liability suits, theft, workers' compensation, and other risks of property and liability losses, direct and indirect, shall have as its goals:

1. Protecting assets of the public transportation system from catastrophic losses.
2. Minimizing total long-term cost to the public transportation system of managing risks.
3. Establishing, through effective loss control and loss prevention measures, a work and service environment in which transit personnel as well as members of the public can enjoy safety and security in the course of their daily pursuits.

Risk Management Functions

The risk manager, reporting to the general manager, shall have the authority and responsibility for:

1. Identifying and measuring all risks of accidental loss through his own efforts and by aiding departments in analyzing risk of accidental loss.
2. Advising all levels of management in the field of loss prevention and safety.
3. Advising and recommending retention levels.
4. Overseeing claims handling and adjusting processes.
5. Maintaining records of losses, claims, insurance premiums, and other risk-related costs.
6. Selecting insurance agents or brokers; purchasing insurance.
7. Coordinating all activities which bear upon risk of accidental loss.
8. Reviewing all contracts with respect to insurance, indemnity, hold numbers, or other risk provisions.
9. Coordinating disaster planning.
10. Ensuring compliance with all applicable state and federal laws or regulations pertaining to insurance.

Risk Retention

The amount of insurance purchased shall provide protection whenever a single accidental loss would result in property loss in excess of $50,000 per incident or liability judgments that would potentially exceed $50,000 per incident. Any losses under $50,000 per incident will be expensed without insurance. When the risk manager believes a case should be excepted from this rule, documentation for such a change should be provided to top management.

Risk Reduction

For a transit system, a detailed, written safety program, which includes a section on driver training, can be useful in obtaining attractive insurance quotations. Moreover, such a program will help in reducing the likelihood of injuries and damages to passengers, employees, and the general public. One of the best methods to control the cost of insurance is to reduce losses. A transit manager armed with a safety program that has been consistent in holding loss cost to a minimum has an effective tool in his possession for negotiating attractive renewal insurance premiums. The effective and professional transit manager will improve the transit property's bargaining position and will help control the insurance premium budget by documenting the results, the organization, and the objectives of the safety program to insurers. An effective, comprehensive safety program should include the following elements:

1. An employee designated to administer the safety program.
2. A schedule setting out when regular safety meetings are held and the conditions that would prompt a meeting at other than the scheduled time (usually inclement weather, or a holiday).
3. A discussion on the role the safety engineer from the insurance company will play in the transit system safety program.
4. A description of the driver award and penalty program. This should include an explanation of how the transit property determines an accident is to be chargeable to a driver.
5. Claims reporting procedures should be spelled out, including the person responsible for each step in the procedures.

Driver training is a critical part of any safety program and it is highly recommended that transit systems work to have an effective driver training program. While most transit systems have at least an informal method for training a new driver, many transit systems do not have a written training program. To be most effective, the training process should be in writing and should include the following:

1. Designation of the system employee responsible for training and retraining of drivers. This should be either a person appointed as safety supervisor or, perhaps, a senior driver with an excellent driving record.
2. A listing of the hiring and retention practices of the transit system; this should include driver health records, license requirements, motor vehicle records, dress, attitude, experience, etc.
3. Each new driver should get a detailed listing of each step, and the time required to move from trainee to bus operator. The probationary period should be clearly specified.
4. The evaluation criteria that will be used by management in judging a new driver's ability to pass from the trainee step to the next step, and the criteria used in identifying when there is a need for a bus operator to go through a retraining program.
5. There should be details of the driver's responsibility towards safety related maintenance of the vehicle. For example, prior to taking a vehicle on the road there should be a check list of safety related observations and inspections the driver should make.
6. A schedule for formal defensive driver training programs.
7. A statement of overall safety policy and claim reporting procedures.

CHAPTER SEVEN

CASH MANAGEMENT

Introduction

The management of cash by a transit property (as in many other organizations) centers on three main areas:

1. Handling and safeguarding cash collected from various sources.

2. Ensuring that sufficient cash is available to meet obligations when due.

3. Investing idle cash to earn a suitable return while minimizing the risk of the loss of that investment.

The first area (cash control) was discussed in Chapter Six. This chapter discusses the other two areas and demonstrates a number of financial tools available to transit managers for cash management including cash budgeting, float, bank services, short-term investments, and accounts payable management.

Cash management involves both collection and disbursement. Collection involves the processing of incoming cash and checks (from the farebox, pass programs, and government agencies). Disbursement activities are related to the paying out of monies owed to employees, suppliers, creditors, etc. As a general rule, cash management should obtain cash from the collection process as quickly as possible, and delay disbursements as long as possible. However, physical limitations of the system (e.g., the ability to pull a limited number of fareboxes per day) and the potential negative effects on working relationships with customers and vendors also need to be considered.

Sources of Cash

Cash has a different role in public transit than in many other types of businesses. Most transit service is provided on a for-cash basis. Many other businesses operate on the credit basis, where the service is rendered, the customer is billed for that service, and payment is received subsequently. In the transit industry, farebox collections generate a large volume of cash, mostly in the form of coin. Prepaid fare programs, for example monthly passes, generate cash in advance of providing the service.

A third potential source of cash is funds generated through taxing powers of the transit agency such as a local sales or property tax. Frequently, the collection of these taxes is administered by a unit of government other than the transit property. Since the transit property receives the tax proceeds once a year, the timing of receipts has implications for the management of cash by the transit property. Similarly, the timing of grant receipts from various government units may force the transit system to find alternative sources of financing to provide the necessary cash to meet the agency's requirements.

Disbursements

Cash disbursements are part of the cash management function. Differences exist in the frequency and size of the cash outflows. The payment of employees and suppliers generally occurs on a uniform basis during the year. Interest and principal payments on bonds issued by the transit property or payments to manufacturers for equipment purchases occur less often.

Collections

Attempting to accelerate collections is one part of cash management. In certain lines of business, a large portion of the sales are made on credit. Collection management in these areas involves processing received payments as quickly as possible. Most public transit properties rely very little on credit sales. Transit systems also operate in a much smaller geographic area than most firms, which affects the nature of the collection problem. The transit property need not worry about the collection of such payments from a wide geographic area. Checks come in from purchasers of transit advertising services, prepaid fare/pass programs, and charter operations, but most importantly, from government agencies in the form of grants.

Transit agencies can try to speed up collections from prepaid pass programs. For example, banks can sell transit passes; checks (and cash) could be credited immediately to the transit property's accounts when a pass is purchased. Other outlets, such as drug stores, could sell passes. A drawback to this approach is the likelihood of delays in the processing of proceeds from pass sales. A transit representative would have to visit the outlet each day, collect the funds (checks and cash), and return them to the transit property for a bank deposit to be prepared. As an alternative, the transit system could permit the retail outlet to make a deposit directly to the bank. The transit property, therefore, would be dependent upon the banking habits of the particular retail outlet operator.

The Cash Flow Time Line

In attempting to understand the various facts of cash management it is helpful to examine a cash flow time line. Such a time line can be drawn for inflows into the organization (money received from passengers) and for cash outflows (payments to suppliers). The cash flow time line indicates the amount and timing of various transactions.

Cash Inflows

Cash payment. The cash inflow time line below demonstrates the simplest case, one in which the service is provided on an immediate cash payment basis. The best example of this in transit would be the payment of a cash fare when a passenger boards a bus.

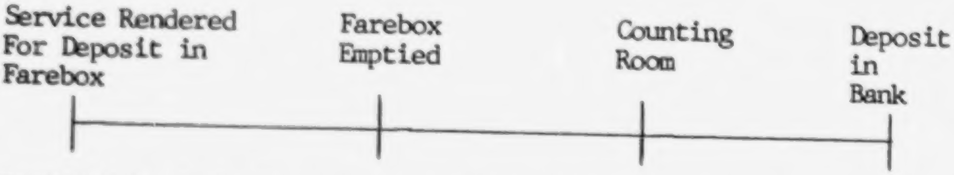


FIGURE 7.1 Cash flow time line/immediate payment.

At a determined interval (nightly, twice-a-week, etc.), the vault in the farebox is pulled and the contents are counted. The cash (bills and coin) are then deposited in a commercial bank. After verification of the deposit, the bank will credit the transit property's account to reflect the new deposits. If the deposit is made after banking hours such crediting will not take place until the next banking day. In this case the transit property's accounting records will show the deposit as having been made on that first day while the bank's records and the bank statement will recognize the deposit as having occurred on the following day. When the bank gives the transit property credit for the deposit, that money becomes known as a "available funds." These available funds can then be used by the bank to pay the checks written by the transit property on its account.

Credit. A more complex situation involves rendering a service for credit where the customer is billed for the services, and makes payment at some subsequent point in time.

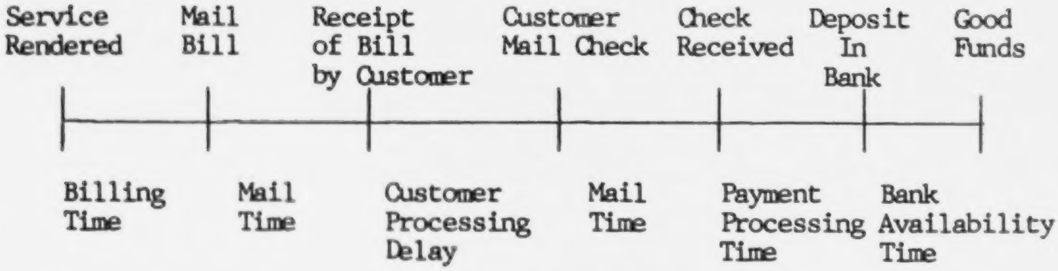

Service Rendered
Mail Bill
Receipt of Bill by Customer
Customer Mail Check
Check Received
Deposit In Bank
Good Funds
Billing Time
Mail Time
Customer Processing Delay
Mail Time
Payment Processing Time
Bank Availability Time

FIGURE 7.2 Cash flow time line/purchase by credit.

The length of time between the rendering of the service and the availability of the cash to the service provider has been increased considerably from that in the cash-for-service setting.

Several steps have been added to the transaction process, some of which are controllable by the service provider whereas others are not. For example, the provider can control billing time and payment processing time as through the design of its own internal systems. The provider usually attempts to minimize billing and payment processing periods as much as possible. The provider can influence the amount of time between the customer's receipt of the bill and mailing of the check. The establishment of credit terms (offering discounts for early payment or specifying a time limit for payment) is based upon the provider's credit policy, which in turn, is frequently based on the credit policies of other firms in the same industry. The provider does not have any control over the internal process used by the customer in processing the bill and preparing the payment. (However, the credit policy can influence the process to some degree.) The provider has little control over the mail time, but can affect the mail time through its choice of locations for the mailing of bills and the place to which payment is to be sent. Finally, the bank availablility time is under the control of the bank, but it may be possible to find different banks offering different availability times.

Cash Outflows

A cash flow time line can be drawn to show the steps and timing involved in paying a firm's suppliers.

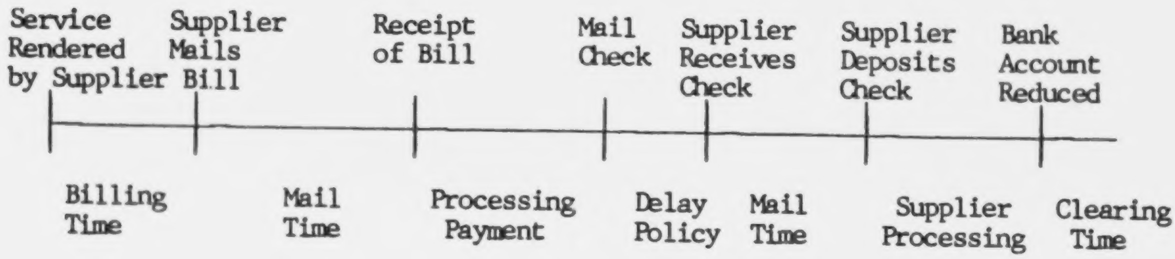

Service Rendered by Supplier
Supplier Mails Bill
Receipt of Bill
Mail Check
Supplier Receives Check
Supplier Deposits Check
Bank Account Reduced
Billing Time
Mail Time
Processing Payment
Delay Policy
Mail Time
Supplier Processing
Clearing Time

FIGURE 7.3 Cash outflow time line.

In the cash inflow time line, the different steps are subject to varying degrees of control by the transit system providing the service. A similar situation exists for the firm receiving the service in the cash outflow time line. Of primary concern is the period of time after the receipt of the bill from the supplier. The amount of time before a check is written depends on the time required to process the invoice for payment and on the accounts payable policy of the firm. The accounts payable policy would determine how long the transit system delays before paying its bill. Prompt payments sometimes qualify for a price discount, while delaying payments allows the transit system to use the money for other purposes.

The clearing time of the check is also of interest. With cash inflows, the transit system is concerned about the availability of the funds, or when the bank allows use of the funds represented by the deposited check. With the cash outflows, the transit system is concerned about the point in time when the bank deducts the amount of the check from its account. Due to the operation of the check handling process, the availability time, and the clearing time for the funds represented, a given transaction need not be the same.

The Concept of Float

Any transaction where cash is not immediately received in exchange for rendering a service or provision of a product can give rise to what is known as "float." Float is created by the time it takes for payments to be processed. This includes the time necessary to prepare invoices, to deliver (by mail or otherwise) those invoices, to prepare payment, to deliver the payment, and to process the payment. A firm's net float is its disbursement float amount minus its deposit float amount. A firm can experience float for money owed to it by its customers, but it can also experience float on money that it owes to its suppliers.

Deposit Float

Deposit float refers to the amount of time between when a firm's creditor mails a check and when the proceeds from that check are available to the firm. This time period is composed of the amount of time it takes for that payment to travel through the mail, the amount of time it takes the firm to process the payment (record the payment and prepare the bank deposit), and the length of time after which the proceeds from that check become available to the firm.

Obviously, a collecting firm wants the deposit float time to be as short as possible. A company that serves a large geographic region (such as a public utility) may have customers mail payments to local offices, rather than to the headquarters. This shortens the time required for the mail to deliver the payments.

A transit property serves a relatively limited geographic area, and the mailing time of payments owed to the property is not a significant factor. The amount of time it takes the transit property to process those payments can be an important aspect of deposit float. If the total dollar amount of the checks received is large, a bank deposit should be prepared each day. Even if a transit property receives only a few checks per day, they should be not allowed to accumulate. There is an opportunity cost represented by the lost interest or use of these funds.

Disbursement Float

Disbursement float refers to the period of time between when a check is written by the firm and when the amount of that check is deducted from the firm's bank account balance. There is a timing difference between when the firm records the check and when the bank actually deducts it from the bank's records of the firm's checking account balance. Included in this time interval is the amount of time that it takes for the check to reach the creditor (mail time), the amount of time required for the creditor to process that check and deposit it in a bank, and finally, the clearing time between when the check is deposited and when it arrives at the firm's bank and is deducted from the firm's account.

Disbursement float works in the favor of a transit system that is paying bills; therefore, it should try to lengthen this time period as much as possible. Remote disbursements refers to a practice whereby a firm uses a bank a long distance away from the creditors to which it is making payment. For example, a Chicago-based firm might choose to make payment to New England area creditor from a bank located in the Pacific Northwest. This practice increases the clearing time. Such a tactic is frequently not possible for a transit property as it is expected to use financial institutions in its local community for its banking activities.

Banking Services

There are a variety of services provided by banks which can be used by transit systems, including: farebox collections/counting, deposit handling, fiscal agents, bond trustees, investment counseling and management, term loans, payroll and other disbursement services, and sales outlet and/or lockbox services for prepaid pass programs. While at any given time a transit system might not require all of these services, the system should be aware that these types of services do exist. It may be less expensive to rely on a bank to process the payroll and other functions than to have that function done in-house.

Banks generally recover their cost of providing services through two methods. The first involves the use of service charges. A specified charge is levied for each deposit handled, certified check issued, or cancelled check processed. The second is through the maintenance of compensating balances. The customer is required to maintain bank accounts with specified balances. The bank invests these deposits and uses the earned interest to offset the cost of providing the banking services to the customer. Frequently a combination of service charges and compensating balances are used.

Selection

There are several different practices for handling banking relationships.

Local banks. One practice is to use many local banks in the transit firm's service area. This reduces the chances that the transit property would be accused of showing favoritism.

There are disadvantages to the use of many banks. The large number of accounts increases the workload of financial managers who must maintain records of all the accounts. Control may be difficult. In addition, banks usually require minimum deposits to be maintained in each account. These minimum balance requirements have the effect of reducing the amount of funds that are available for use elsewhere.

For example assume that the transit system has chosen to open accounts with five local banks, each of which requires a minimum deposit of $1,000. Thus a total of $5,000 will be tied up in these five accounts. If the transit property used only one bank for all of its banking activity it would have to maintain the $1,000 minimum balance in just one bank. Therefore, $4,000 would be available for investment in interest-earning accounts for other purposes.

Competitive bid. Another approach is to seek competitive bids from interested banks. Such an action could be initiated through a request for proposals and/or bids. The nature of the types of services sought by the transit firm would have to be indicated. Examples of such services would include coin counting, payroll accounting, and checking accounts. The transit property should also indicate the volume of activity which is expected to take place. This data would include the number of deposits to be made, the number of checks to be drawn against the account, and the quantity of any other services which might be needed by the transit property. Based upon this information, banks may then submit bids. The vendor bids would be evaluated in terms of the cost to the transit property, the range of services offered, and other appropriate criteria applicable to the particular situations.

The bidding approach may not be feasible where significant competition between banks does not exist, such as in smaller communities. It is also possible that a close, friendly working relationship between the bank and the transit property would not be achievable due to the nature of the bidding process.

Account Analysis

An account analysis can be performed on the transit system banking activities to determine if it is using the most favorable method of compensating its bank for the banking services rendered. To perform such an analysis, it is necessary to collect data on the volume of the various types of banking services used by the transit property along with the service charge schedule of the bank. Whenever the transit property is required to pay a service charge, this information should be available from the bank statement. Any minimum balance or compensating balance requirements also need to be noted.

In the following example, the transit system is paying for its banking activities on a fee-for-service basis. The activity and services charges follow:

50 deposits at 5¢ each	$ 2.50
1,000 checks at 6¢ each	60.00
400 credit vouchers at 7¢ each	28.00
Three zero-balance accounts at $25 each	75.00
Total monthly service charge	$ 165.50

Thus the total service charges incurred by the transit system are $165.50 per month. This amount represents the cost to the bank of providing these services to the transit system. The bank could either cover that cost directly by imposing the service charges or it could use money that it earns on the funds that the transit property has on deposit. The bank is able to loan (or otherwise invest) a portion of the funds on deposit with it.

To determine the required account balance that would exactly cover the bank's cost of providing the service, the following analysis could be performed. We will use the same level of banking activity and service charge schedule as in the above example. The monthly cost to the bank of the transit property's account is $165.50. The money that the bank earns on the transit system deposit can be used to offset this cost. Assume that the bank is able to earn 9.6% on its investments. Banks are required by law to maintain a minimum reserve of funds that cannot be invested or loaned out. Therefore, the bank cannot earn a return on the reserved funds. This minimum reserve is stated as a percentage of its total deposits. In our example, this reserve requirement is 8.6%. The bank must retain 8.6% of its total deposits to comply with the reserve requirement. It is able to invest 91.4% of its deposits and earn a return of those funds (1 - reserve requirement = 1 - .086 = .914).

We can now determine the size of the bank account balance required to cover the service charges of $165.50 per month.

$$\text{Balance to cover annual service charge} = \frac{\text{Service charge}}{\text{Interest rate} \times (1 - \text{Reserve requirement})} \times 12 \text{ months}$$

$$= \frac{165.50}{.096 \times (1 - .086)} \times 12$$

$$= \$22{,}634.03$$

It is necessary to multiply the service charge by 12 because the interest rate and the reserve requirement are each expressed as an annual rate. This calculation indicates that an average deposit of $22,634 would generate sufficient earnings for the bank to cover its cost of serving the transit property.

Next, we can determine if the transit property is overcompensating or undercompensating the bank by examining the actual cash balance in its account.

Ledger balance		$ 54,500
Average float	-	15,000
Net collected balance		$ 39,500
Required balance	-	22,634
Excess (or shortage)		$ 16,866

The ledger balance is the bank account balance according to the transit system's books. Since the amount of the float is in the bank's favor (negative float), it is substracted to arrive at the net collected balance. (The net collected balance is the balance amount according to the bank's records). The required account balance determined in the previous step is subtracted from the net collected balance. If the result is greater than zero, the transit system is maintaining an amount in excess of what is required to cover the service charges. When the result is less than zero, the transit system is not maintaining an account balance sufficient to compensate the bank.

It is generally believed that paying for banking services with fees is better than maintaining compensating balances because funds can usually earn a higher rate of interest than the bank gives you credit for on your compensating balances. If you are required to maintain large minimum balances in an account to meet other financial requirements, the attractions of the fee-for-service may be reduced because those funds are not available to the transit property to invest.

Zero-balance Accounts

With a zero-balance account the bank maintains a master account that contains the entire amount of the transit property's deposit with that bank. The transit property also has a number of other accounts with that bank which are used for specific functions. There might be an employee payroll account, an account for paying vendors, and other accounts for various purposes. Having a separate account for each function provides better control and makes auditing easier. Maintaining a required minimum amount in each account would tie up more funds. With a zero-balance account, the bank would transfer enough funds from the master account to each zero-balance account to cover the checks presented for payment on that day to the account.

One-time Cash Transfer

An analysis of the transit system's financial records might indicate that the system is keeping excessively large cash balances in its bank accounts. For example, suppose that over a given period of time a particular checking account balance never goes below \$500. If the bank does not have any minimum balance requirement (or a compensating balance requirement), then the transit property is maintaining an excess amount of cash in that account. The transit property should consider a one-time transfer of those funds out of that account. The account could be reduced by \$500. The transferred funds could be placed in an interest-bearing account (if allowed by law) or invested in some short-term investment, such as one of those discussed later in this chapter.

Short-term Investments

A wide variety of short-term investments is available to a transit system. When evaluating the options for investment, financial managers are challenged by the question of risk versus return. Less secure (risky) investments yield a higher rate of return, but investors from the public sector have less freedom to accept higher risk than the private sector. Criteria to consider include:

1. Safety--the possibility of default resulting in the loss of earned interest income and maybe even the principal amount invested.

2. Price stability--investments with volatile prices pose a risk in the event of a price decrease.

3. Marketability or liquidity--how rapidly the security can be disposed of for cash.

4. Maturity--the length of time between the purchase of a security and when it comes due.

5. Yield--annual rate earned on a security based on the actual earnings over the period of time that the investment is held. (also called the rate of return of the investment).

Treasury bills. The Treasury bill, or T-bill, is considered to be the safest investment because it is issued and backed by the federal government. T-bills are available in both three month and six-month denominations, but shorter periods can be acquired in the secondary market. A secondary market involves the buying and selling of existing securities among investors. The primary market involves the sale of new securities by a firm or government agency to investors. T-bills can be purchased from banks or through a broker. Treasury bills are sold at a discount: for a T-bill with a \$10,000 face value, a purchaser would pay less than \$10,000 when buying the Treasury bill, and would receive the \$10,000 face value at maturity. For example, assume that a three-month \$1,000,000 T-bill is being sold at a 9% discount. The price to be paid is:

$$(\$1{,}000{,}000)\ [1 - ((.09)\ (91/360))] = \$977{,}250$$

The first term (\$1,000,000) is the face value of the bill. The second term (1 - [(.09)(91/360)] is the discount factor. This term includes the interest rate (9%) and the length of time until maturity (91 days). The interest rate is stated as an annual rate; therefore, the equation is adjusted to reflect that the life of the security is less than a full year. This is accomplished by dividing the 91 days by 360 days. (Note that in some financial calculations a year is considered to contain 360 days.)

Repurchase agreement. A "repo" usually involves the sale of short-term securities by a bank or a securities dealer. This type of investment is considered safe since the underlying instrument is a U.S. Treasury security. Repos are issued for a very short period of time, usually having a maturity of a few days. There is no secondary market for repos.

Commercial paper. Commercial paper is a short-term, unsecured loan to a corporation with a maturity of 30 days to nine months. Commercial paper can be sold directly or through dealers. The yield tends to be 1/4% to 1/2% greater than the T-bill rate. A good secondary market for commercial paper does not exist so most paper is held until maturity. Commercial paper is generally sold in large denominations, usually of at least $25,000.

Negotiable certificates of deposit. A "CD" is a deposit of funds at a commercial bank for a specified period of time and at a specified rate of interest. The minimum deposit amount is usually $100,000. A secondary market exists for CDs of large banks. Yields on CDs are higher than those on T-bills and repos, and are similar to the yields of commercial paper and bankers' acceptances. CDs are not guaranteed.

State and municipal notes. State and municipal notes may involve tax or revenue anticipation notes or general obligation bonds. They are guaranteed by the issuer. These securities are generally tax exempt. The anticipation notes normally have a maturity of one year or less while the bonds have maturities ranging from five to 40 years. These notes usually pay interest at maturity. There is an active secondary market for the bonds. Since these securities are tax exempt they are not an attractive investment for publicly owned transit authorities that are not subject to the payment of income taxes.

Federal agency issues. Federal agency issues are issued by a variety of federal agencies. These instruments are guaranteed by the issuing agency, but not by the federal governments. Maturities can be as long as 15 years, although most issues mature in a year or less. Generally, agency securities have a slightly higher yield than Treasury securities of equal maturity. A secondary market has developed involving securities dealers who handle the treasury securities. Foreign securities provide higher yields (due to higher risk). Risk also exists with respect to fluctuations in exchange rates.

Cash Discounts

It is frequently possible to use amounts owed to suppliers as a source of funds. This is known as trade credit and is a very common source of short-term financing. The purchaser of a good or service is not required to pay upon delivery, but is allowed to defer payment for a short period of time. This approach would involve situations where discounts are offered by suppliers for the payment of bills within a specified period of time. Items are purchased on credit with payment not due until a period of time after the merchandise has been delivered to the transit property. If payment is made before some specified time, a supplier may allow the purchaser to deduct a percentage of the total invoice amount and to remit the remaining amount.

A simple example can be used to demonstrate whether a cash discount should be taken. When the supplier offers a discount, there are three acceptable payment dates from the perspective of a good public transit financial managers.

1. Last day of discount period.
2. Last day of net period.
3. Some day beyond net period.

In terms of the amount paid, paying on any day prior to the last day of the discount period is the same as paying on the last day of the discount period. Similarly, paying on the second to last day of the net period is the same as paying on the last day of the net period. However, the transit system still has use of the funds for an additional period if they pay on the last day. You can never do better than waiting until the last day of the discount period (if the discount is taken) or waiting until the last day of the net period if the discount is not taken. Thus, only three periods of time for potential payment need to be considered.

An important decision to make is whether or not a discount should be taken. The discount should be taken if the effective interest rate implied by missing the discount is greater than the cost of borrowing funds from another source. The effective borrowing rate if a discount is not taken (I *), is computed as following:

$$I^* = \frac{(\text{Interest Paid})}{(\text{Actual Cost})} \times (\text{Time Adjustment})$$

$$I^* = \frac{dA}{(1 - d)A} \times \frac{365}{L2 - L1}$$

where:

d = percentage discount offered
L1 = day the discounted amount is due
L2 = day the net amount is due
A = nominal cost of purchase

In the first example, we assume that the terms given by a particular supplier are "2/10, n30". This means that if the bill is paid within 10 days, the purchaser may take a 2% discount. If the discount is not taken (not paid in 10 days) then the full amount is due on the 30th day. Using the formula we have:

$$I^* = \left(\frac{d}{1 - d}\right) \times \left(\frac{365}{L2 - L1}\right)$$

$$= \left(\frac{.02}{1 - .02}\right) \times \left(\frac{365}{30 - 10}\right)$$

$$= \left(\frac{.02}{.98}\right) \times \left(\frac{365}{20}\right)$$

$$= 37.2\%$$

Thus the effective interest rate for not taking the discount is equivalent to borrowing money from another source at 37.2%. Since this effective borrowing rate far exceeds our cost of borrowing funds, we would take the discount.

In our second example we have terms of 5/30, 4/60, n61. If the bill is paid within 30 days we can deduct 5% from the amount due. If the bill is paid after the 30th day but before the 60th day we can deduct 4%. The full amount is due on the 61st day. Two computations are required here. The first is to determine I* if

$$I^*1 = \left(\frac{.05 - .04}{1 - .05}\right) \times \left(\frac{365}{60 - 30}\right)$$

$$= \frac{.01}{.95} \times \frac{365}{30}$$

$$= 12.8\%$$

$$I^*2 = \left(\frac{.04}{1 - .04}\right) \times \frac{365}{(61 - 60)}$$

$$= \frac{.04}{.96} \times \frac{365}{1}$$

$$= 142.1\%$$

It is also possible to postpone payments of payables beyond the end of the due period. This is known as stretching accounts payable. For example, assume that under terms of 2/10, n30, it is decided to pay on day 60. The discount is not taken and the full amount of the invoice is paid 30 days after the final due date. The calculation of the effective borrowing rate would be:

$$I^* = \frac{.02}{1 - .02} \times \frac{365}{30 - 10 + 30} = 14.9\%$$

The above equation is based upon the equation used to find the effective interest rate of not taking the discount. The number of days past the due date when payment is made is added to the denominator of the time adjustment factor.

Given the same credit as above, but choosing to pay on day 90 (60 days past the due date) results in an I* of:

$$I^* = \frac{.02}{1 - .02} \times \frac{365}{30 - 10 + 60} = 9.3\%$$

There are certain actual and potential costs to stretching accounts payable. Ill will may develop between the purchaser and the supplier. A penalty fee may be charged by the supplier for past due payment. The credit suppliers may stop delivery or insist that all future transactions be on a cash for merchandise basis.

Cash Flow Forecasts

The following exercise should help demonstrate the process of developing a cash flow forecast for the year 1985. We are given certain data for 1984 along with expected changes for 1985. The Income Statement for the year ending December 31, 1984 is shown in Table 7.1 and the Balance Sheet is shown in Table 7.2. (For more detail on Balance Sheets and Income Statements, see Chapter Two, Accounting Fundamentals.)

There are several changes expected to occur in 1985 for which we will have to adjust our figures in this exercise:

1. Revenues are expected to increase by 50%, to $90.
2. The cost of operations will also increase by 50%, to $210.
3. Administrative expenses will rise to $40.
4. Depreciation for 1985 will be $12.
5. Equipment purchases in 1985 will be $40 (80% federal funds, 20% state funds).
6. The accounts receivable amount will double.
7. The desired ending cash balance for 1985 is $15.
8. Accounts payable will increase to $20.
9. Short-term investments will be increased to $10.
10. Inventory will be increased to $50.

TABLE 7.1 Income Statement (Working Draft)

	1984	1985
Revenues (farebox)	$ 60	
Cost of operations	140	
Depreciation	20	
Administration	30	-----
Earnings before subsidy	$(130)[1]	
Operating assistance	130[2]	
Net income	$ 0	

Note 1: Revenues - cost of operations - depreciation - administration = earnings before subsidy.

Note 2: If earnings before subsidy is negative, operating assistance must equal the absolute value of earnings before subsidy, in order to make net income equal to zero.

TABLE 7.2 Balance Sheet (Working Draft)

	1984	1985		1984	1985
Cash	10	-----	Accounts payable	15	---
Short-term investments	5	-----	Short-term loans	5	---
Accounts receivable	5	-----			
Inventory	30	-----	Fund equity	150	---
Property/equipment (net)	120	-----			
Total assets	170		Total liability and equity	170	

Given this information, we must calculate the operating assistance that is necessary for 1985. Items 1 through 3 involve changes which affect the income statement. Item 4 contains information which affects both the income statement and the balance sheet. The information continued in items 5 through 10 affect the balance sheet.

TABLE 7.3 Income Statement (Final)

	1984	1985
Revenues (farebox)	$ 60	$ 90
Cost of operations	140	210
Depreciation	20	12
Administration	30	40
Earnings before subsidy	(130)	(172)
Operating assistance	130	172
Net income	0	0

Given the expected revenue and expenses figures for 1985 we find that operating assistance in the amount of $172 will be necessary to arrive at a net income of $0. See Table 7.3 and Table 7.4 for the final version of the income statement and the balance sheet for 1984 and 1985.

TABLE 7.4 Balance Sheet (Final)

	1984	1985		1984	1985
Cash	10	15	Accounts payable	15	20
Short-term investment	5	10	Short-term loans	5	23 *
Accounts receivable	5	10			
Inventory	30	50	Fund equity	150	190
Property/ equipment	120	148 *			
Total assets	170	233	Total liability and equity	170	233

* See explanation in text.

The property/equipment net increase is $28. This figure is determined by taking the $40 equipment purchase (item 5) and subtracting the expected increase in depreciation of $12 (item 4). Thus we have total assets of $233. You will recall that in a balance sheet the total assets = total liabilities and equity. Therefore, we need to have $233 for the total liability and equity.

The 1985 accounts payable and fund equity amount to sum to $210. Thus in order to balance this equation we will need to increase the short-term loans to $23. This is known as a plug figure as we can borrow the amount necessary to make the balance sheet equation correct.

Based upon the information contained in these two financial statements we can develop a projected cash flow for 1985.

An increase in any asset account represents a use of cash. For example, increasing short-term investments from $5 in 1984 to $10 in 1985 requires $5 of cash. A decrease in any asset is a source of cash. Suppose the transit property had a land account of $15 of which it sold $10 for cash. This $10 would be a source of cash.

A decrease in any liability is a use of cash. If there were salaries payable of $10 listed on the 1984 balance sheet and this figure was reduced to $5 on the 1985 balance sheet, the change would represent a use of cash. An increase in any liability is a source of cash. Thus, in our example, the increase in accounts payable from $15 in 1984 to $20 in 1985 is a source of cash.

Net income represents a source of cash while a net loss would be a use of cash. In addition, depreciation expense is a non-cash expense and can be added back as a source of cash. When figuring net income the depreciation is subtracted as an expense. You will recall that depreciation represents the allocation of a portion of the acquisition cost of a capital asset over the useful life of that asset. The outflow of cash occurred when the asset was purchased. As depreciation is a non-cash expense we can add back the amount represented by the depreciation expense as a source of cash. See Table 7.5 for a cash flow schedule for 1985.

TABLE 7.5 Cash Flow Schedule for 1985

Sources of Cash	
Net income	0
Depreciation	12
Grant	40
Accounts payable	5
Total sources	57
Uses of Cash	
Cash	5
Short-term investment	5
Accounts receivable	5
Inventory	20
Property/equipment	40
Total uses	75

The difference between the total uses of ($75) and total sources ($57) is $18. This is the amount by which short-term loans increase from 1984 to 1985. Remember that an increase in a liability represents a source of cash.

CHAPTER EIGHT

DEBT FINANCING

An Introduction to Debt

Debt is a pledge against the future. It is an obligation to commit future revenue in return for a current benefit. In the context of public institutions, such as a transit authority or a local government, debt is often viewed as something to be avoided. However, it has valuable uses in the financing of public expenditures. Debt is incurred through borrowing, which is an alternative to taxation or raising fares as a means of generating money to cover expenditures. Essentially, borrowing allows a transit system to finance expenditures without directly increasing the present expenses to the general public, unlike raising taxes or fares. Borrowing allows a transit system, or a local government, to use a stream of future taxes to raise a large amount of money in the present. When a transit system borrows money, it is giving up revenue that it anticipates receiving in the future. Therefore, if a transit agency needs new buses today, it can finance the local share by obligating revenue that it expects to receive in the future. The cost of borrowing is the interest that is paid on the debt.

Purposes of Debt

Debt has several different functions that apply to public transit. Debt allows a transit system to:

- Cover the difference between current receipts and current expenditures when operating assistance is delayed.

- Pay for the acquisition of assets that are needed before the agency is willing or able to pay for them.

- Spread the costs of a facility or vehicle over its useful life instead of paying the entire costs up front.

- Shift a portion of the cost of facilities with long lives into the future and allow those who will benefit from it to pay their share.

- Meet emergencies when current revenues or resources are insufficient to cover them.

- Raise the local share of a capital expense partially covered by a capital grant.

The amount of debt that a local government may incur can be limited by the state if the debt is financed by tax revenues. This can be done by the imposition of either constitutional or statutory limitations on the borrowing power of the local government. Typically, a debt ceiling is set based on a percentage of the property tax base. Some states may also require that the issuance of debt be passed by referendum. The debt limit would only apply to guaranteed bonds, that is, those backed by the taxing authority of the state or local body, but not to bonds that are not guaranteed (such as revenue bonds). The enabling legislation which is used to create a transit authority usually specifies what taxing authority, how much debt, and what kinds of debt mechanisms a transit authority may use.

Classifying Debt

Debt may be classified in a number of ways. Several of the more widely used classification systems follow.

1. Form. The form of debt refers to the type of instrument by which it is represented. Debt comes in many different forms, some of which are formal, such as the issuance of bonds or the signing of a mortgage. Others forms are more informal, for example, accounts payable.

2. Purpose. The purpose of the debt or the reason that the debt was incurred is another form of classification. Debt can be incurred to finance capital expenditures or to meet operating expenses.

3. Function. The governmental function for which the proceeds of the debt are incurred may include fire protection, education, the public health, and public transportation.

4. Entity. The entity refers to the governmental body that is issuing the debt, for example, school districts, counties, fire protection districts, transportation districts, etc.

5. Period. The period that the debt covers can either be short-term (less than one year), intermediate (one to five years), or long-term (over five years).

6. Security. Security refers to what is being pledged to back the debt. In the case of bonded debt this could be: general obligation, backed by the full faith, credit, and taxing power of the issuer; special tax or assessment where the revenue generated is used to pay off the bond; and revenue, where the bond is paid by revenue generated from the facilities or service being financed by the debt such as fares from public transportation.

Types of Debt

There are three types of debt based on length of maturity, (short-term, intermediate, and long-term). The term of the debt depends on what is being financed. It is usually preferable to match the term of the debt with the life of the asset. Long-term debt should be used for financing capital improvements or assets with a life that will meet or exceed the length of the bond. Short-term debt should be used for financing present operations.

Short-term Debt

Short-term debt has a length of maturity of one year or less. It is used to meet temporary deficits or shortages of cash because revenues or subsidies are not received in time to meet current expenditures. It is also used to meet emergencies due to unforeseen events or natural disasters. Even if a budget is flexible enough to allow for unforeseen expenditures, such as higher maintenance caused by an exceptionally hard winter, there may still be a shortfall of monies to cover such expenditures. Short-term debt can be used to cover this temporary shortfall. Short-term debt is just that--it should not be put off or converted to long-term debt. It is a sign of inefficiency and ineffective planning when long-term debt is used to fund short-term expenditures.

Notes. Notes are a promise to pay at a future date. Usually a note specifies the date or dates when payment is due, the amount to be paid and the rate of interest. Notes can be issued for various purposes, ranging from loans in anticipation of current revenue to loans in anticipation of costs. (See Appendix A for examples of anticipation notes.)

An agency may want to delay issuing bonds because of unfavorable current interest rates or some other factor. If an agency needs funds to meet immediate needs, but the bond issuance is delayed or is taking longer than expected, then the transit system might issue notes in anticipation of these funds.

Loans. Loans in anticipation of locally generated revenue are very common. They are used as temporary debt to bridge the gap between current expenditures and revenue. Loans in anticipation of state or federal funds and long-term debt can be used to bridge the gap between when the money is needed and when it will be available. In the case of state and federal funds (grants, subsidies, etc.), their receipt may not coincide with expenses. There may be inadequate cash flow at certain times of the year due to long delays between expenses and reimbursement. The agency can anticipate receiving funds sometime in the future (less than one year). The net effect is that they can shift revenue from the future, when it will not be needed, to the present when it is needed.

Long-term Debt

Long term debt lasts for a term of five years or longer. The most common type of long-term debt is bonded debt. Other types of long-term debt include certificates of indebtedness, lease purchase agreements, vendor financing, and certificates of participation. State and local bond issues are exempt from federal tax; therefore, they are sold at a lower yield than taxable bonds of similar quality and maturity.

Bonded debt. A bond is a written promise to pay a specific amount of money, called the face value or principal, at some specified date or dates in the future. Periodic interest is also paid at a specific rate at certain dates in the future. Bonds can be classified as follows:

1. General obligation or revenue (the nature of the security backing them).

2. Term, sinking, or serial.

3. Bearer or registered.

General obligation bonds. These bonds are backed by the full faith and credit of the issuing body (transit agency, county, city, etc.). They generally have the lowest interest rates of all bonds because they are the most protected and, therefore, are the most secure. They are backed by the issuer's ability to levy a tax (e.g., property tax, sales tax, etc.).

To issue general obligation bonds, the issuer must have the authority and power to tax. Most school districts can use property taxes to finance bonds, but in many states, transit agencies do not have taxing authority. States can and frequently do impose constitutional or statutory limitations on the borrowing power of the local governments. They commonly set a ruling on the amount of the debt as a percentage of the property tax base. Some states require that the issuance of debt be approved by referendum. The debt limit does not apply to non-guaranteed or revenue bonds.

Revenue bonds. Interest and principal payments must come from net revenues of the enterprise and often from the specific project that is being financed. Common examples in the transportation industry are bonds secured by highway, bridge, tunnel tolls, or fares. Revenue bonds cannot be used by transit agencies that are continually in debt. Another form of revenue bond which might have applications to transit is a special assessment bond which is secured by specific levies on property benefitting from the public improvements, such as economic development near a subway or people mover financed by the bonds.

The life of most state and local debt is generally based on the expected life of the asset being financed, but this is not strictly adhered to. Revenue bonds are usually not guaranteed and do not have any claim on the general credit or taxing power of the public body that issues them. The MTA in New York was able to successfully issue revenue bonds, secured by their system fares.

The advantages of revenue bonds include the following:

1. Revenue bonds allow public bodies to raise money when they are otherwise restricted from doing so because of debt limitations.

2. Unlike other municipal bonds that frequently have to be voted on by referendum, revenue bonds need only be authorized by the transit board.

3. Revenue bonds can be used by authorities that do not have taxing authority and cannot issue general obligation bonds.

The disadvantages of revenue bonds include the following:

1. Since they usually do not require public approval, the issuing agency may become less responsive to the state of the economy and the public's desire.

2. Revenue bonds usually have a higher interest rate than general obligation bonds, all other factors being equal.

3. Since there is no debt ceiling restriction on revenue bonds an agency may overburden itself with debt.

4. Revenue bonds frequently have larger issuing costs.

5. Many revenue bonds require the effective amortization of the debt long before the economic life of the equipment or facility expires.

6. Revenue bonds may require the assurance from the subdizing local governments that they won't let the public transit agency go bankrupt.

Term/sinking fund and serial bonds. Depending on the method of redemption, bonds can be either term/sinking fund, or serial bonds. In a term bond issue, all bonds mature (come due) on a single date. The sinking fund is used to accumulate periodic deposits that are required to be made to pay off the debt at its maturity. This may be required at the time of the bond issue, by the law, or by some other agreement that is made between the issuer and the bondholder.

Term bonds may be callable, which means they can be retired before the date they mature. The redemption may be made at par (face value) or sometimes a small premium must be paid. This premium declines as the bonds get closer to the maturity date. If the market price of the bond is lower than the face amount, the issuer will want to buy them off the open market in order to fulfill the requirements of the sinking fund.

Serial Bonds differ from term bonds because they do not all mature on the same date. Different maturities are offered to meet the demands of various bond buyers. The interest rates on serial bonds will vary with the length of time to maturity. Depending on the current money market, bonds of shorter term will have a lower rate of interest than long-term bonds.

For a transit system, serial bonds are preferable because of the flexibility they offer. They should be easier to market because a variety of terms can be offered to buyers. They also gave the transit agency greater flexibility in arranging its debt structure.

There are two types of serial bonds: straight bonds, and annuity serial bonds. A transit system can offer both types of bonds and gain the advantages of both. With straight serial bonds, the principal is paid in equal amounts annually, but the interest payments are large at the beginning of the term and decline towards the maturity date. Annuity serial bonds have equal payments over the life of the bond. The payment will include both principal and interest like a mortgage on a house.

Bearer and registered bonds. Bearer bonds are negotiable instruments and may be transferred from one person to another without notifying the issuing agency. Ownership is not recorded; the bearer of the bond is the owner. Attached to bearer bonds are coupons that must be clipped and sent to the paying agent of the bond issuer to receive interest payments.

Registered bonds are registered on the books of the issuing body or its paying agent. Interest payments are paid only to the registered owner. When these bonds are transferred, the registration of ownership must be changed.

Zero coupon bonds. Zero coupon bonds are relatively new and gaining in popularity. The primary feature of this type of bond is that it does not pay any interest. Instead these bonds are sold initially at prices substantially below their face value. This difference will depend on the interest rate at the time of the issuance and on the term of the bond. On the maturity date, the issuer pays the face value of the bond in one lump sum to the bond owner. The bonds are sold at a discount such that the value at maturity will provide a return that is equivalent to bonds of a similar nature that pay interest periodically, such as serial bonds. United States Savings Bonds are an example of this type of instrument.

Zero coupon bonds allow issuers to compete in the market when otherwise they may not be able to do so because they cannot offer bonds with competitive interest rates or cannot afford to make interest payments on the bonds. Since the proceeds from the sale of the bonds will be less than the face value, the issuer will have to make a greater offering in order to net the amount it needs for financing. This difference between the purchase price and the face value may cause the issuer to reach its debt limit faster. The issuer may be able to save from .5% to 4% on the relative interest cost of the bonds depending on the maturity, the timing of the sale and credit rating of the issue. (See Appendix A for an example.)

Certificates of indebtedness. Certificates of participation, also known as equipment trust certificates, are an example of a certificate of indebtedness. Sometimes they are like bonds but their use indicates that the debt is backed by a lesser pledge of the issuer's resources than would be by a bond. The maturities of the certificates are set to match the life of the asset and usually run 10 to 12 years. A certificate of participation shows that an investor or investors own a share of a piece of equipment or property and they are entitled to interest and principal payments. The investor participation is based on how much they invest and is evidenced by the certificate. They are issued by a trustee and not by the agency that is acquiring the equipment, although the agency may guarantee repayment of the debt. This allows the buyer to spread the cost of the investment among many investors. The investor then leases his share back to the agency. Generally, the title of the equipment will be held by the trustee and will be transferred to the agency when it has complied with the terms of the agreement. This is a common way to finance lease purchase agreements for many types of assets. This instrument cannot be used to finance operating budgets. For the interest payments on the certificates to be tax exempt, the agency must qualify as a political subdivision under Section 103 of the IRS Code and the contract must be structured as an installment contract. (See Appendix A for an example.)

Lease purchase agreements. A lease purchase agreement allows an agency to have immediate use of equipment or property without purchasing it. With the help of financial institutions, investors are found who will purchase the asset and then lease it back to the agency. The agency agrees to pay back the purchase price plus interest to the investors over a period of years. The agency will then be able to purchase the asset for a relatively small amount at the end of the contract.

Like other interest-paying debt, lease purchase agreements attract investors who are looking for tax-exempt interest payments. For the interest payments to be exempt, the agency must be a political subdivision under the requirements of Section 103 of the IRS Code. Lease purchase agreements are not considered debt, so voter approval is not needed. A restriction on the use of this instrument is that the contract cannot be classified as debt by state or local law. To meet this requirement, a non-appropriation clause must be inserted. This allows the agency to cancel the contract without penalty if funds are not available in the future. Because of the higher risk to the investor associated with this clause, lease purchase agreements have interest rates 1% to 2% higher than bonds. (See Appendix A for an example.)

Vendor financing. Vendor financing is provided by the seller of the equipment to the purchasing agency. An agency that is submitting bids for equipment can ask the vendor to include terms for loans, loan guarantees, or some other type of arrangement that would give the agency access to funds for purchasing of the equipment. If a vendor provides financing, it may also put a higher purchase price on its equipment. The financing provided by the vendor should be compared to other available financing to make sure it is competitive. The agency should also take into account that it might be able to buy the equipment at a lower cost if vendor financing is not required. The equipment purchased acts as collateral against the loan. In order to take advantage of vendor financing, the agency must have the authority to issue long-term debt.

Planning and Issuing Debt

Regardless of the type of debt that an agency plans to issue, it should do so only after it has developed a financial plan that includes debt policy. The development of a debt policy must be done with the awareness and consideration for the law as well as the agency's present financial situation, and various market and political factors.

Debt can be very useful to an agency to fund present equipment and or expansion needs, but it must be well managed. By managing its debt properly an agency will have a better financial reputation. This reputation will affect its credit rating and may allow the agency to pay off debts at lower interest costs.

Issuing Bonds

If an agency is financing a project or the purchase of equipment through a bond issue it will need the guidance and assistance from several groups. A financial advisor, a bond counsel (law firm), and a feasibility consultant work together to advise the agency on such matters as the feasibility of the project, the amount of money to be raised, the legal ramifications of the sale, and the type of security to be issued.

Investment bankers/underwriters. The primary mover in the offering of bonds is the investment banking firm. Investment banks, despite their name, do not perform the same services as a neighborhood bank. Their job is to market securities. They do this by buying the issue, which is called underwriting the bond issue. Investment banks purchase these blocks of securities with the intention of selling them at a profit. Recognized as experts in the securities market, their function is to bring borrowers and lenders together. The underwriter acts as a wholesaler and buys the bonds from the issuer and then resells them at a profit to investors. The investment banker provides certain expertise and skill that are important to the successful offering of the bonds. Although the services of an investment banking firm are not absolutely necessary, a transit agency would have great difficulties and incur substantially larger expenses in the sale of their issue. The costs of marketing bonds are about .75% of the total bond issue for the underwriting fee when the sale is negotiated. The management group will be paid about .25% of the bond issue for originating and managing the underwriting syndicate.

Underwriters of bond issues generally form a syndicate with other investment banks in order to spread the risk and not have a large percentage of their money tied up in one issue. The leader of the underwriting syndicate is called the "managing underwriter." In a negotiated bond sale, the managing underwriter will be involved from the very beginning as part of the bond working group. The selection of the underwriter can either be made by negotiation or competitive bid.

Financial advisor. The financial advisor should be someone from a commercial bank who has knowledge and experience in dealing with municipal securities or from a reputable financial advisory firm. Larger banks may have a municipal securities department. The financial advisor can give advice on the different financing options available. The advisor will assist the agency's treasurer in structuring the financing program, preparing the official documents, and if there is a competitive bid, providing the issuing agency with advice on the bids.

Feasibility consultant. In the case of a large capital improvement (over $1 million), a feasibility consultant may be hired to review the proposed project and make an evaluation report, which may be included as part of the official statement. The consultant may also be used in the negotiations for the construction contract.

Bond counsel. The bond counsel is an attorney who specializes in the area of municipal finance. The bond counsel has the primary responsibility of drafting the documents essential to the financing after the bond working group has approved the basic terms.

Bond issuer. The agency (bond issuer) is represented by an executive officer of the agency who is responsible for getting the process started in the right direction. The representative of the agency will work closely with the financial advisor to determine the best course for the financing of the project. This person is also responsible for setting the goals of the bond group in preparation for the debt issue.

Selection of Underwriter

Negotiated underwriting. Many transit revenue bonds are sold on a negotiated basis. This negotiation process starts with the issuing agency discussing the flotation of a bond issue with an investment banking firm.

If an agency has not dealt with an investment bank before, it can get a recommendation from a commercial bank or visit two or three firms. The representative of the agency should be prepared to provide information about the agency and the proposed project. Although the firm will not be able to make an exact estimate of the costs or of the return of the bond issue, it can provide an initial analysis. Final arrangements will need to be negotiated before an agreement is reached. When visiting an investment bank the representative of the agency should tell them that he will be visiting other banks with the same proposal.

Negotiated underwriting has some advantages compared to competitive bidding. The advantages include:

1. An agency that has not had a bond issue before and is not known by investment banks may find it necessary to select a firm by negotiation.

2. An investment bank may offer more assistance to an agency if they know that they will not lose the contract to a competitor.

The disadvantages of negotiated underwriting include:

1. It may not provide a comparable basis for evaluating the bond price.
2. The selection of a reputable firm is very important.
3. There is the loss of the beneficial effects of competitive bidding.

Competitive bidding. Competitive bidding has been the customary way in which underwriters have been selected. State and/or local governments almost always require that the sale of general obligation bonds be done by competitive bidding. Through a public invitation by the issuer (the official notice of sale), underwriters make sealed bids to win the right to sell the bonds to the public. Other than this difference, all other aspects of underwriting by competitive bid are the same as negotiated underwriting.

The advantages of competitive bidding include:

1. The market potential is expanded because the sale is advertised through public notice and advertisements in financial publications.
2. The public interest is ordinarily best served through the open and competitive bidding process because the cost of borrowing money is usually reduced.

The disadvantages of competitive bidding include:

1. Small and intermediate bond issuers may not attract enough bids because of the large size of the transit bond market.
2. Many investors are reluctant to buy transit bonds because transit has a long history of unprofitable operations.
3. The results of the auction may not be what was expected because of a lack of competition among bidders.

Timing of the Debt Issue

The timing of offering a bond issue to the market is critical to the relative success of the offering. Because the market for municipal and transit bonds changes daily, the proceeds from a bond sale will vary depending on the market conditions at the time of the sale. The objective of the agency is to get the money it needs at the lowest possible cost, by paying the least amount of interest.

There are a number of factors affecting the price the agency gets for its bonds and will in turn affect the timing of the bond offering.

These include:

- The economy and general market conditions, interest rates, inflation, recession, etc.
- The supply of bond offerings, especially bond offerings made by other transit agencies or municipalities. Remember you are competing for investors' dollars.
- The demand for tax exempt bonds by banks, insurance companies, and individual investors. This is affected by the state of the economy and also by tax rates, inflation, and expectations about future interest rates.
- The credit rating of the borrowing agency.
- Public confidence in the financial health of state and local governments in general.

Based on his experience and knowledge of the market, the managing underwriter will determine the best timing of the issue.

CHAPTER NINE

CAPITAL EXPENSES

Introduction

A capital expense decision has a greater financial impact than any other single decision a financial manager will ever make. The operating expenses of a system, in the long run, are greater than the amount of money spent on capital acquisitions; but many decisions over a period of many years determine how much is spent on operations. Capital expenditure decisions tend to occur infrequently, involve a long time horizon, involve large sums of money, and can be very costly to reverse if the wrong decision is made.

There are many trade-offs involved in any kind of capital expenditure decision. Do you prefer a fixed cost or a variable cost? Do you prefer a known or an unknown cost? Do you want to spend more now for quality and durability, or spend more later for higher maintenance costs and sooner replacement? In order to evaluate these tradeoffs and make the proper decisions you need reasonable estimates of required service levels for years in advance. In addition to good service planning, there are many financial tools that can aid a decision maker. This chapter discusses a few of those tools that help a decision maker to make better decisions and can also save money for a transit system after that decision is made.

Time Value of Money

An extremely important factor in any financial decision is the time value of money. The time value of money can be described most simply by the fact that one dollar today is worth more than one dollar next year, or at any point in the future. This is true because the very posession of money has a value. Those with money can rent the use of their money to those with an immediate need for money. The charge for the use of the money, in addition to the repayment of the money itself (the principal), is called the interest.

Simple techniques have been developed to determine how quickly invested money will grow because of the accrued interest. The future value of a specified amount of money can be determined as long as the time period is known and an interest rate can be assumed. Frequently when doing financial planning or considering a capital purchase, it is necessary to have a specific amount of money at a future day. A similar process to determinning the future value can be used to determine the present value of the amount of money that must be invested now, in order to assure that the specified amount is available when needed. The first step to understanding techniques for determining future and present values is to understand interest rates and the principles of compounding interest.

Compound Interest

An interest rate is specified as a percentage of the amount borrowed or loaned per unit of time. The amount borrowed or loaned is called the principal. When interest is compounded, the amount of interest earned during a unit of time is added to the principal. Interest for the next time period is calculated by multiplying the same interest rate by the new principal amount. The frequency with which the interest is compounded can significantly affect how quickly the invested money grows. The following example shows how the investment of $100 under different compounding factors can affect the final amount:

Compounding	$P_v(1+i)^n$	Amount at end of year
Annually	$100 \cdot (1.12)^1$	$112.00
Semiannually	$100 \cdot (1.06)^2$	$112.36
Quarterly	$100 \cdot (1.03)^4$	$112.55
Monthly	$100 \cdot (1.01)^{12}$	$112.68

Future Value

The future value of an amount of money today is the original amount (beginning principal) plus any interest that will be earned during a particular time period. The basic formula to use is:

$$F_v = P_v(1 + i)^n$$

where F_v = future value

P_v = present value

i = interest rate per period

n = number of periods

The number of periods can be found by multiplying the number of years by the number of times per year compounding takes place.

Similarly, the interest rate per time period is the interest rate per year divided by the number of times per year compounding takes place. In the above compounding example under quarterly compounding, the interest rate per period and number of periods can be calculated as follows:

$$i = \frac{12\%/\text{ per year}}{4 \text{ periods per year}} = 3\% \text{ per period}$$

Example 1. How much will $2,500 deposited today at 12% compounded annually be worth 5 years from today?

$$\begin{aligned} Fv &= Pv\,(1 + i)^n \\ &= \$2{,}500\,(1 + .12)^5 \\ &= \$2{,}500\,(1.12)^5 \\ &= \$2{,}500\,(1.7623) \\ &= \$4{,}405.85 \end{aligned}$$

Example 2. The Metropolitan Transit Authority deposits $20,000 today as the local share for a future building expansion. How much will the MTA have at the end of 10 years if it earns 12% compounded semiannually?

$$\begin{aligned} Fv &= Pv\,(1 + i)^n \\ Fv &= \$20{,}000\,(1+.06)^{20} \\ &= \$20{,}000\,(1.06)^{20} \\ &= \$20{,}000\,(3.2071) \\ &= \$64{,}142.80 \end{aligned}$$

$i = \frac{.12}{2} = .06$; and $n = 10 \times 2 = 20$, due to semiannual compounding.

Present Value

Given an amount of money needed at a future date and the estimated interest rate, we can compute how much money we need to deposit today. This process is called discounting. We discount a future amount of money by using a discount rate, otherwise known as an interest rate, for the specified amount of time. The basic formula for determining the present value is:

$$Pv = \frac{Fv}{(1 + i)^n}$$

Tables of discount factors are available which represent the present value of $1, given the number of periods and the interest rate per period. The effects of compounding on the interest rate and number of periods is the same for present value problems as it is for future value problems. Also, the discount factor table can be used in future value problems by substituting 1/discount factor for $(1+i)^n$.

Example 3. How much money should Easyville Transit deposit in the bank if it can earn 10% compounded annually in order to buy a bus in two years with an expected cost of $160,000? Easyville Transit's local share will be 20% of $160,000, or $32,000.

$$Pv = Fv \cdot (\text{discount factor})$$

$$= \$32000 \cdot (.826)$$

$$= \$26{,}432$$

The discount factor .826 came from Table 9.1 under the column 10% for two years. The $26,432 is the amount of money Easyville Transit's local share should deposit today in order to cover 20% of the total cost in two years.

Example 4. Acme Transit is planning to build a terminal building in 5 years. The cost of the project has been estimated at $1,750,000. How much should be deposited today to cover the local share if it can earn 8% compounded quarterly?

$$Fv = .20 \cdot (1{,}750{,}000) = \$350{,}000$$

$$n = 5 \text{ years} \times 4 \text{ periods/year} = 20$$

$$i = \frac{8\% \text{ per year}}{4 \text{ periods per year}} = 2\%/ \text{ per period}$$

$$Pv = Fv \cdot (\text{discount factor})$$

$$Pv = \$350{,}000 \cdot (.673)$$

$$Pv = \$235{,}550$$

The discount factor, .673, comes from Table 9.1, and can be found in the 2% column for 20 periods.

TABLE 9.1 Present Value Table

	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714	0.690	0.667
2	0.980	0.961	0.925	0.890	0.857	0.826	0.797	0.769	0.756	0.743	0.718	0.694	0.672	0.650	0.640	0.630	0.610	0.592	0.549	0.510	0.476	0.444
3	0.971	0.942	0.889	0.840	0.794	0.751	0.712	0.675	0.658	0.641	0.609	0.579	0.551	0.524	0.512	0.500	0.477	0.455	0.406	0.364	0.328	0.296
4	0.961	0.924	0.855	0.792	0.735	0.683	0.636	0.592	0.572	0.552	0.516	0.482	0.451	0.423	0.410	0.397	0.373	0.350	0.301	0.260	0.226	0.198
5	0.951	0.906	0.822	0.747	0.681	0.621	0.567	0.519	0.497	0.476	0.437	0.402	0.370	0.341	0.328	0.315	0.291	0.269	0.223	0.186	0.156	0.132
6	0.942	0.888	0.790	0.705	0.630	0.564	0.507	0.456	0.432	0.410	0.370	0.335	0.303	0.275	0.262	0.250	0.227	0.207	0.165	0.133	0.108	0.088
7	0.933	0.871	0.760	0.665	0.583	0.513	0.452	0.400	0.376	0.354	0.314	0.279	0.249	0.222	0.210	0.198	0.178	0.159	0.122	0.095	0.074	0.059
8	0.923	0.853	0.731	0.627	0.540	0.467	0.404	0.351	0.327	0.305	0.266	0.233	0.204	0.179	0.168	0.157	0.139	0.123	0.091	0.068	0.051	0.039
9	0.914	0.837	0.703	0.592	0.500	0.424	0.361	0.308	0.284	0.263	0.225	0.194	0.167	0.144	0.134	0.125	0.108	0.094	0.067	0.048	0.035	0.026
10	0.905	0.820	0.676	0.558	0.463	0.386	0.322	0.270	0.247	0.227	0.191	0.162	0.137	0.116	0.107	0.099	0.085	0.073	0.050	0.035	0.024	0.017
11	0.896	0.804	0.650	0.527	0.429	0.350	0.287	0.237	0.215	0.195	0.162	0.135	0.112	0.094	0.086	0.079	0.066	0.056	0.037	0.025	0.017	0.012
12	0.887	0.788	0.625	0.497	0.397	0.319	0.257	0.208	0.187	0.168	0.137	0.112	0.092	0.076	0.069	0.062	0.052	0.043	0.027	0.018	0.012	0.008
13	0.879	0.773	0.601	0.469	0.368	0.290	0.229	0.182	0.163	0.145	0.116	0.093	0.075	0.061	0.055	0.050	0.040	0.033	0.020	0.013	0.008	0.005
14	0.870	0.758	0.577	0.442	0.340	0.263	0.205	0.160	0.141	0.125	0.099	0.078	0.062	0.049	0.044	0.039	0.032	0.025	0.015	0.009	0.006	0.003
15	0.861	0.743	0.555	0.417	0.315	0.239	0.183	0.140	0.123	0.108	0.084	0.065	0.051	0.040	0.035	0.031	0.025	0.020	0.011	0.006	0.004	0.002
16	0.853	0.728	0.534	0.394	0.292	0.218	0.163	0.123	0.107	0.093	0.071	0.054	0.042	0.032	0.028	0.025	0.019	0.015	0.008	0.005	0.003	0.002
17	0.844	0.714	0.513	0.371	0.270	0.198	0.146	0.108	0.093	0.080	0.060	0.045	0.034	0.026	0.023	0.020	0.015	0.012	0.006	0.003	0.002	0.001
18	0.836	0.700	0.494	0.350	0.250	0.180	0.130	0.095	0.081	0.069	0.051	0.038	0.028	0.021	0.018	0.016	0.012	0.009	0.005	0.002	0.001	0.001
19	0.828	0.686	0.475	0.331	0.232	0.164	0.116	0.083	0.070	0.060	0.043	0.031	0.023	0.017	0.014	0.012	0.009	0.007	0.003	0.002	0.001	
20	0.820	0.673	0.456	0.312	0.215	0.149	0.104	0.073	0.061	0.051	0.037	0.026	0.019	0.014	0.012	0.010	0.007	0.005	0.002	0.001	0.001	
21	0.811	0.660	0.439	0.294	0.199	0.135	0.093	0.064	0.053	0.044	0.031	0.022	0.015	0.011	0.009	0.008	0.006	0.004	0.002	0.001		
22	0.803	0.647	0.422	0.278	0.184	0.123	0.083	0.056	0.046	0.038	0.026	0.018	0.013	0.009	0.007	0.006	0.004	0.003	0.001	0.001		
23	0.795	0.634	0.406	0.262	0.170	0.112	0.074	0.049	0.040	0.033	0.022	0.015	0.010	0.007	0.006	0.005	0.003	0.002	0.001			
24	0.788	0.622	0.390	0.247	0.158	0.102	0.066	0.043	0.035	0.028	0.019	0.013	0.008	0.006	0.005	0.004	0.003	0.002	0.001			
25	0.780	0.610	0.375	0.233	0.146	0.092	0.059	0.038	0.030	0.024	0.016	0.010	0.007	0.005	0.004	0.003	0.002	0.001	0.001			
26	0.772	0.598	0.361	0.220	0.135	0.084	0.053	0.033	0.026	0.021	0.014	0.009	0.006	0.004	0.003	0.002	0.002	0.001				
27	0.764	0.586	0.347	0.207	0.125	0.076	0.047	0.029	0.023	0.018	0.011	0.007	0.005	0.003	0.002	0.002	0.001	0.001				
28	0.757	0.574	0.333	0.196	0.116	0.069	0.042	0.026	0.020	0.016	0.010	0.006	0.004	0.002	0.002	0.002	0.001	0.001				
29	0.749	0.563	0.321	0.185	0.107	0.063	0.037	0.022	0.017	0.014	0.008	0.005	0.003	0.002	0.002	0.001	0.001	0.001				
30	0.742	0.552	0.308	0.174	0.099	0.057	0.033	0.020	0.015	0.012	0.007	0.004	0.003	0.002	0.001	0.001	0.001					
40	0.672	0.453	0.208	0.097	0.046	0.022	0.011	0.005	0.004	0.003	0.001	0.001										
50	0.608	0.372	0.141	0.054	0.021	0.009	0.003	0.001	0.001	0.001												

Annuities

An annuity is a series of equal payments made at the beginning or end of equal time periods. A common example of an annuity is a monthly rental payment. There are several types of annuities. An ordinary annuity is an annuity where the payments are due at the end of each period. An annuity due is an annuity where the payments are due at the beginning of each period. A deferred annuity is an annuity where the first payment is due sometime after the first period.

Here, we will deal with ordinary annuities. Table 9.2 contains an annuity discount table. The following formula and examples demonstrate how to use annuities.

$$Pa = \frac{Am\,[1 - (1 + i)^{-n}]}{i}$$

where: Pa = the present value of an annuity

Am = the periodic payment

i = interest rate per period

n = number of periods

Since $[1 - (1+i)^{-n}]/i$ is simply the ordinary annuity discount factor, this factor can be found using Table 9.2 by looking at the interest rate per period and number of periods.

Example 5. Maumee Transit has bought a computer and must pay $5,000 at the end of each of the next ten years to the Kurtz Computer Company. How much is the present value of the annuity Kurtz is to receive if the discount rate is 10%?

First, we can set up the problem as a series of present value problems. The following discount factors were found in Table 9.1.

TABLE 9.2 Annuity Table

	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714	0.690	0.667
2	1.970	1.942	1.886	1.833	1.783	1.736	1.690	1.647	1.626	1.605	1.566	1.528	1.492	1.457	1.440	1.424	1.392	1.361	1.289	1.224	1.165	1.111
3	2.941	2.884	2.775	2.673	2.577	2.487	2.402	2.322	2.283	2.246	2.174	2.106	2.042	1.981	1.952	1.923	1.868	1.816	1.696	1.589	1.493	1.407
4	3.902	3.808	3.630	3.465	3.312	3.170	3.037	2.914	2.855	2.798	2.690	2.589	2.494	2.404	2.362	2.320	2.241	2.166	1.997	1.849	1.720	1.605
5	4.853	4.713	4.452	4.212	3.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991	2.864	2.745	2.689	2.635	2.532	2.436	2.220	2.035	1.876	1.737
6	5.795	5.601	5.242	4.917	4.623	4.355	4.111	3.889	3.784	3.685	3.498	3.326	3.167	3.020	2.951	2.885	2.759	2.643	2.385	2.168	1.983	1.824
7	6.728	6.472	6.002	5.582	5.206	4.868	4.564	4.288	4.160	4.039	3.812	3.605	3.416	3.242	3.161	3.083	2.937	2.802	2.508	2.263	2.057	1.883
8	7.652	7.325	6.733	6.210	5.747	5.335	4.968	4.639	4.487	4.344	4.078	3.837	3.619	3.421	3.329	3.241	3.076	2.925	2.598	2.331	2.108	1.922
9	8.566	8.162	7.435	6.802	6.247	5.759	5.328	4.946	4.772	4.607	4.303	4.031	3.786	3.566	3.463	3.366	3.184	3.019	2.665	2.379	2.144	1.948
10	9.471	8.983	8.111	7.360	6.710	6.145	5.650	5.216	5.019	4.833	4.494	4.192	3.923	3.682	3.571	3.465	3.269	3.092	2.715	2.414	2.168	1.965
11	10.368	9.787	8.760	7.887	7.139	6.495	5.937	5.453	5.234	5.029	4.656	4.327	4.035	3.776	3.656	3.544	3.335	3.147	2.757	2.438	2.185	1.977
12	11.255	10.575	9.385	8.384	7.536	6.814	6.194	5.660	5.421	5.197	4.793	4.439	4.127	3.851	3.725	3.606	3.387	3.190	2.779	2.456	2.196	1.985
13	12.134	11.343	9.986	8.853	7.904	7.103	6.424	5.842	5.583	5.342	4.910	4.533	4.203	3.912	3.780	3.656	3.427	3.223	2.799	2.468	2.204	1.990
14	13.004	12.106	10.563	9.295	8.244	7.367	6.628	6.002	5.724	5.468	5.008	4.611	4.265	3.962	3.824	3.695	3.459	3.249	2.814	2.477	2.210	1.993
15	13.865	12.849	11.118	9.712	8.559	7.606	6.811	6.142	5.847	5.575	5.092	4.675	4.315	4.001	3.859	3.726	3.483	3.268	2.825	2.484	2.214	1.995
16	14.718	13.578	11.652	10.106	8.851	7.824	6.974	6.265	5.954	5.669	5.162	4.730	4.357	4.033	3.887	3.751	3.503	3.283	2.834	2.489	2.216	1.997
17	15.562	14.292	12.166	10.477	9.122	8.022	7.120	6.373	6.047	5.749	5.222	4.775	4.391	4.059	3.910	3.771	3.518	3.295	2.840	2.492	2.218	1.998
18	16.398	14.992	12.659	10.828	9.372	8.201	7.250	6.467	6.128	5.818	5.273	4.812	4.419	4.080	3.928	3.786	3.529	3.304	2.844	2.494	2.219	1.999
19	17.226	15.678	13.134	11.158	9.604	8.365	7.366	6.550	6.198	5.877	5.316	4.844	4.442	4.097	3.942	3.799	3.539	3.311	2.848	2.496	2.220	1.999
20	18.046	16.351	13.590	11.470	9.818	8.514	7.469	6.623	6.259	5.929	5.353	4.870	4.460	4.110	3.954	3.808	3.546	3.316	2.850	2.497	2.221	1.999
21	18.857	17.011	14.029	11.764	10.017	8.649	7.562	6.687	6.312	5.973	5.384	4.891	4.476	4.121	3.963	3.816	3.551	3.320	2.852	2.498	2.221	2.000
22	19.660	17.658	14.451	12.042	10.201	8.772	7.645	6.743	6.359	6.011	5.410	4.909	4.488	4.130	3.970	3.822	3.556	3.323	2.853	2.498	2.222	2.000
23	20.456	18.292	14.857	12.303	10.371	8.883	7.718	6.792	6.399	6.044	5.432	4.925	4.499	4.137	3.976	3.827	3.559	3.325	2.854	2.499	2.222	2.000
24	21.243	18.914	15.247	12.550	10.529	8.985	7.784	6.835	6.434	6.073	5.451	4.937	4.507	4.143	3.981	3.831	3.562	3.327	2.855	2.499	2.222	2.000
25	22.023	19.523	15.622	12.783	10.675	9.077	7.843	6.873	6.464	6.097	5.467	4.948	4.514	4.147	3.985	3.834	3.564	3.329	2.856	2.499	2.222	2.000
[illegible]	22.795	20.121	15.983	13.003	10.810	9.161	7.896	6.906	6.491	6.118	5.480	4.956	4.520	4.151	3.988	3.837	3.566	3.330	2.856	2.500	2.222	2.000
	23.560	20.707	16.330	13.211	10.935	9.237	7.943	6.935	6.514	6.136	5.492	4.964	4.524	4.154	3.990	3.839	3.567	3.331	2.856	2.500	2.222	2.000
	24.316	21.281	16.663	13.406	11.051	9.307	7.984	6.961	6.534	6.152	5.502	4.970	4.528	4.157	3.992	3.840	3.568	3.331	2.857	2.500	2.222	2.000
29	25.066	21.844	16.984	13.591	11.158	9.370	8.022	6.983	6.551	6.166	5.510	4.975	4.531	4.159	3.994	3.841	3.569	3.332	2.857	2.500	2.222	2.000
30	25.808	22.396	17.292	13.765	11.258	9.427	8.055	7.003	6.566	6.177	5.517	4.979	4.534	4.160	3.995	3.842	3.569	3.332	2.857	2.500	2.222	2.000
40	32.835	27.355	19.793	15.046	11.925	9.779	8.244	7.105	6.642	6.234	5.548	4.997	4.544	4.166	3.999	3.846	3.571	3.333	2.857	2.500	2.222	2.000
50	39.196	31.424	21.482	15.762	12.234	9.915	8.304	7.133	6.661	6.246	5.554	4.999	4.545	4.167	4.000	3.846	3.571	3.333	2.857	2.500	2.222	2.000

End of Year	Payment	Discount	Pa
1	$5,000	.909	$4,545
2	5,000	.826	4,130
3	5,000	.751	3,755
4	5,000	.683	3,415
5	5,000	.621	3,105
6	5,000	.564	2,820
7	5,000	.513	2,565
8	5,000	.467	2,335
9	5,000	.424	2,120
10	5,000	.386	1,930
TOTALS	$50,000	6.144	$30,720

However, we can use the ordinary annuity discount table to find the discount factor without adding up the discount factors from Table 9.2. The ordinary annuity discount factor, 6.145, can be found by looking at Table 9.2 under the discount rate of 10% with ten annual payments. (The difference between 6.144 and 6.145 is caused by rounding.)

$$\begin{aligned} Pv &= Am \cdot (\text{ordinary annuity discount factor}) \\ &= \$5{,}000 \cdot (6.145) \\ &= \$30{,}750 \end{aligned}$$

Although Kurtz receives a total of $50,000 over the next ten years, the present value of this annuity is only $30,725.

Example 6. Shieldstown Transit wishes to purchase five buses in five years for an expected cost of $200,000 per bus. If 80% of the cost is funded by Section 9 capital grants, how much should Shieldstown Transit deposit in the bank at the end of each of the next five years if the interest rate is 8% per year?

Total cost: 5 x $200,000	$1,000,000
Less: Section 9 of .8(total cost)	- $800,000
Local share	$200,000

First, find the present value of the $200,000:

Pv = Fv (factor)

= $200,000 (.681)

= $136,200

Now, find the annual deposits:

Pv = Am (ordinary annuity discount factor)

136,200 = Am (3.993)

$$Am = \frac{136,200}{3.993}$$

Am = $34,109.69

Life-cycle Costing

Life-cycle costing is a valuable analytical tool that goes beyond merely examining the initial capital investment when considering alternative capital expenditure decisions. In its simplist form, life-cycle costing estimates the total cost of ownership, including purchase, operation, and maintenance, over the entire useful life of the equipment. The degree of complexity and accuracy can vary widely depending upon how much detail is desired in operating and maintenance cost projections and on how many assumptions and estimates are required to predict future events and their costs.

The significant cost factors that are usually considered in a life-cycle cost analysis include total fuel consumption, cost per gallon, and miles per gallon; tire cost and tire life in miles; the replacement and repair costs, the number of occurances, and the timing of the event for brakes, air conditioning, and transmissions; and estimates for the cost of preventive maintenance. Depending upon the nature of the decision, it may also be necessary to include driver's wages and shop equipment. An analysis that considers all of these related costs over the useful life of the vehicle, or equipment, demonstrates that the actual initial capital expense is only a small part of the total expense related to the decision.

Because of the significant portion of total life-cycle costs that are in addition to the initial purchase, it is possible that the expenditure choice with the low bid may actually cost more by the end of the useful life of the purchase. It is also possible to discount the future expenses related to operating and maintenance costs so that a present value can be determined. This present value is particularly important when the investment choices have different schedules for operating and maintenance expenses.

Life-cycle Costing Example

The following example is a simplified version of a life-cycle cost analysis of the purchase, operation, and maintenance of one 40-foot transit coach. The same process could be used to analyze other options; then the choice with the lowest present value could be identified. Much of the information on operating and maintenance cost estimates can be obtained from the manufacturers, but you should be cautious about using their figures. Whenever possible, you should check their figures with other transit systems that have actual operating experience with the product. For the purpose of this example, we make the following assumptions. (Other assumptions are included in the worksheet.)

Useful life of vehicle = 12 years

Average miles/year = 45,000

Miles/gallon = 4.5

Fuel cost (average over next 12 years) = $1.10

Labor rate/hour = $15.00

Preventive maintenance cost/mile = $.09

Calculation Worksheet

BUS LIFETIME

12	X	45,000	=	540,000
# useful years		# miles/year		Est. bus lifetime in miles (EBL)

ACQUISITION COST/BUS

1	X	$160,000	=	**$160,000**
# buses		Cost/bus		**ACQUISITION COST**

FUEL LCC

540,000	÷	4.5	=	120,000
EBL		Est. m.p.g.		Total gal. in EBL

120,000	X	$1.10	=	**$132,000**
Total gal. in lifetime		Cost/gal.		**FUEL LCC**

TRANSMISSION LCC

540,000	X	200,000	=	2
EBL		Est. miles between overhaul (EMB)		# overhauls

Event	Labor Hours		Labor Rate		Material Cost		Cost Per Event
Remove & install	6	X	15.00	+	600	=	690
Dismantle, overhaul, & test	8	X	15.00	+	150	=	270
					Cost per overhaul	=	960

960	X	2	=	**$1,920**
Cost/overhaul		# overhauls		**TRANSMISSION OVERHAUL LCC**

BRAKE REPAIR LCC

540,000	÷	60,000	=	9
EBL		EMB reline-turn drums		# relines - turn

540,000	÷	240,000	=	2
EBL		EMB reline-new		# relines - new

Event	Labor Hours		Labor Rate		Material Cost		Cost Per Event
Reline-turn	6	X	15.00	+	75	=	165
Reline-new	6	X	15.00	+	200	=	290

165	X	6	+	290	X	2	=	**1,570**
Reline-turn cost		# relines-turn		Relines-new cost		# relines-new		**BRAKE REPAIR LCC**

AIR CONDITIONING & VENTILATION REPAIR LCC
Compressor overhaul

540,000	÷	90,000	=	6
EBL		EMB overhaul		# overhauls

Event	Labor Hours		Labor Rate		Material Cost		Cost Per Event
Remove & reinstall	6	X	15.00	+	150	=	240
Rebuild	8	X	15.00	+	250	=	410

240	+	410	=	650	X	5	=	3,250
Remove cost		Rebuild cost		Cost/overhaul		#overhauls		Compressor LCC

Blower Overhaul

540,000	÷	90,000	=	6
EBL		EMB overhaul		# overhaul

Event	Labor Hours		Labor Rate		Material Cost		Cost Per Event
Remove & replace	4	X	15.00	+	75	=	135
Rebuild motor	4	X	15.00	+	120	=	180

135	+	180	=	315	X	5	=	1,575
Remove cost		Rebuild cost		Cost/overhaul		# overhauls		Blower LCC

Condenser Motor Overhaul

540,000	÷	90,000		6
EBL		EMB overhaul		# overhauls

Event	Labor Hours		Labor Rate		Material Cost		Cost Per Event
Remove & replace	2	X	15.00	+	50	=	80
Rebuild motor	4	X	15.00	+	75	=	135

80	+	135	=	215	X	5	=	1,075
Remove cost		Rebuild cost		Cost/overhaul		# overhauls		Condenser LCC

3,250	+	1,575	+	1,075	=	**5,900**
Compressor LCC		Blower LCC		Condenser LCC		**AIR CONDITIONER LCC**

PREVENTIVE MAINTENANCE LCC

.09	X	540,000	=	48,600
Cost/mile		EBL		PREVENTIVE MAINTENANCE LCC

BUS LCC

Acquisition cost	$ 160,000
Fuel LCC	$ 132,000
Transmission repair LCC	$ 1,920
Brake repair LCC	$ 1,570
Air conditioning repair LCC	$ 5,900
Preventive maintenance LCC	$ 48,600
TOTAL LIFE-CYCLE COST —	**$ 349,990**

TIME VALUE ADJUSTED LCC

Discount rate = 10%

Item	Timing (year in which event occurs)	Present Value Factor		Cost Per Event or Per Year		Present Value Cost
Acquisition cost	0	1	X	160,000	=	160,000
Fuel cost	1 - 12	6.814	X	(132,000/12)	=	74,954
Transmission cost	5	.621	X	960	=	596
	9	.424	X	960	=	407
Brake repair	2	.826	X	165	=	136
	3	.751	X	165	=	124
	4	.683	X	165	=	113
	7	.513	X	165	=	85
	8	.467	X	165	=	77
	10	.386	X	165	=	64
Brake replace	6	.564	X	290	=	164
	11	.350	X	290	=	101
Air conditioner repair	2	.826	X	650	=	537
	4	.683	X	650	=	444
	6	.564	X	650	=	367
	8	.467	X	650	=	304
	10	.386	X	650	=	251
Preventive maintenance	1 - 12	6.814	X	(48,600/12)	=	27,597

TOTAL PRESENT VALUE LIFE-CYCLE COST = $266,321

Vehicle Rehabilitation

Rehabilitation of currently owned buses is a very important alternative for upgrading the quality of a transit system's fleet. A comprehensive capital replacement plan should consider using rehabilitation of part of the system's fleet rather than purchasing new vehicles whenever the old ones deteriorate past the point where it is cost effective to maintain them. A good preventive maintenance program can keep a vehicle in intensive service for many years, but there comes a time when continuing maintenance becomes impractical because of excessive cost. If no replacement vehicle is available, you are forced to continue an expensive maintenance program, while also incurring the additional unmeasurable costs of unreliable service. If you have planned ahead, there are many factors to consider and there are financial tools available to help you determine whether you want to purchase a new vehicle or rehabilitate the old vehicle.

Defining Rehabilitation

Rehabilitation is a thorough rebuilding and/or replacement of all essential mechanical parts combined with a complete refinishing of the interior and exterior appearance. Rehabilitation goes far beyond a good preventive maintenance program. Although many of the individual tasks of rehabilitation are routinely handled in a good preventive maintenance program, UMTA has established standards which must be achieved in rehabilitation in order to assure that the useful life of the vehicle will be extended at least five years. These standards include specifications for: rebuilding the transmission, engine, steering system, and suspension; replacing the brake system, exhaust system, wheel housings, instruments and guages, interior lighting, floor covering, and window latch and seals; repainting the interior and exterior; reupholstering seats; and rehabilitating the heating and cooling systems.

Normally, a standard size transit bus would be considered a candidate for rehabilitation after it has reached 12 years and/or 500,000 miles of service. Except under unusual circumstances, UMTA requires transit properties to operate a bus at least 12 years before it will fund it for rehabilitation. This is done to ensure that systems do not neglect their maintenance programs. Depending upon local conditions and the quality of maintenance, any single vehicle may need rehabilitation long before, or long after it has surpassed these standards. A vehicle must be cared for at least well enough to maintain its structural integrity in order to make rehabilitation cost effective.

Smaller transit vehicles (less than 35 feet in length) and vans are also potential candidates for rehabilitation, but are much less frequently considered. The frames and general construction of smaller vehicles are not nearly as durable as standard transit buses and do not hold up to the abuse of rugged driving conditions nearly as well. If they are to be considered for rehabilitation, it must be done in a shorter time frame, with fewer miles of service, and carefully considered on a case-by-case basis (as all buses, regardless of size, should be).

Advantages of Rehabilitation

Cost. The initial total cost of rehabilitating buses can be as low as one-third the cost of a new vehicle. Average costs are difficult to develop because the scope of rehabilitation varies widely depending upon the condition of the buses, the vendor, the location of the vendor, the extent to which mechanical improvements were included, and many other factors. The lower total cost of rehabilitation, compared to purchasing new buses, allows properties to upgrade the quality of their fleet and the quality of service when their need exceeds or approaches the limit of available funds. Although the guaranteed share of the gas tax has made capital funds available in greater quantities to many operators. Federal funds are still limited. Traditionally, need has exceeded the available resources.

Another financial benefit of using rehabilitation is the possibility of deferred maintenance. It is possible to save money by reducing the level and quality of preventive maintenance on vehicles when there is already a plan to rehabilitate them. A certain level of effort must be maintained or the bus will not be worth rehabilitating, or the cost of rehabilitating will exceed any savings. In order to make this judgment, you must know what your maintenance expenses are for specific tasks, what will be done during rehabilitation, when it will be done, and what the incremental costs of specific elements within the scope of the rehabilitation will be. The time value of money and the percentage of local share are both important factors. The money you save is spread out over time long before the rehabilitation, while the money you spend is a lump sum at the end of the project. The money you save is an operating expense, of which you must pay 50%. The local share of the money you spend varies, but in most cases will be 20% (or less, depending upon possible state contributions).

Other advantages. The overall quality of rehabilitated buses has been rated highly by participating operators. Some operators report that rehabilitation can add up to 10 years to the service life of a vehicle. Some operators have also reported that new technology buses actually have higher maintenance costs than older, rehabilitated buses. After rehabilitation, the older, new look buses, sometimes get 20-30% better gas mileage than the advanced design buses.

For many reasons, whether it is uncertainty about the availability of capital funds, uncertainty about the availability of operating funds affecting the ability to maintain levels of service, or whatever else, it is sometimes difficult to commit your property to major capital acquisition programs. Rehabilitation offers a short-term solution to fleet unreliability problems that gives you more time to do long-range planning. Rehabilitation is often a much faster way to acquire replacement buses than going through the time consuming procedures for procuring new buses.

Disadvantages of Rehabilitation

Rehabilitation should never be used as a policy for an entire fleet in order to avoid creating an entire fleet that is on the verge of obsolescence. Rehabilitation is at best, a short-run solution that is appropriate for only part of the fleet. A large percentage of rehabilitated buses in your fleet may create a large maintenance problem in the near future and will require you to prepare a plan for replacing them much sooner than if new vehicles were purchased.

A rehabilitated bus may be as old as 20 years old while it is still providing regular service. Replacement parts may become difficult to locate and more expensive to obtain. If the proper parts cannot be located, reliability could suffer or you might have to rebuild or construct replacements at a relatively higher cost. Because the technology is so old, the bus may lack some of the valuable modern improvements. Some necessities and amenities can be added during rehabilitation (e.g., wheelchair lifts, air conditioning).

When is Rehabilitation Appropriate?

The factors that determine whether or not rehabilitation is an appropriate option include the size of your fleet and peak demand, the age and condition of your fleet, whether you are expanding or cutting back service, and whether or not you have any emergency needs to replace vehicles or expand service. Of course, cost and the availability of federal money is always a major factor.

The type of equipment a transit system uses is one very important factor which contributes to the image of the system. While rehabilitated buses are a great improvement over well-used vehicles, they are not as prestigious as modern, state-of-the-art equipment. In some cities, tradition is an asset, while in other cities, particularly when transit service has been unreliable, it may be much more beneficial to establish a new, more modern service. The image of a system is a marketing tool that should be carefully considered.

If you have a large number of old buses, rehabilitation provides you with an opportunity to upgrade the quality of your fleet at the lowest total and the lowest local investment. However, the percentage of rehabilitated buses in your fleet should be kept lower than 20-25%, unless new vehicles are not an option (e.g., not enough available funding).

Rehabilitation is a good option for upgrading a small portion of your fleet in order to give you more flexibility in assigning buses, improving your spare ratio, or experimenting with service expansions without an excessive financial commitment. Rehabilitated buses must be used in regular service, at least on a rotating basis. They cannot be used merely to stockpile buses (if federal funds are used).

In an emergency situation, it is possible to rehabilitate buses much quicker than it is too purchase new ones, especially in times when demand for new vehicles is higher and waiting lists are long. This is particularly valuable when there is a sudden demand for new service and you are without an adequate supply of spare vehicles to cover the demand and maintain enough spares to ensure a reasonable level of reliability. This is also beneficial when design flaws (e.g., cracked frames), or excessive breakdowns suddenly plague a system.

Rehabilitating buses is also appropriate when a vehicle replacement cycle relys too heavily on mass purchases of new vehicles to replace most or all of a fleet at the same time. This kind of replacement cycle makes maintenance scheduling difficult because of slack time when the new vehicles run well, and overloads when all of the vehicles become old and develop maintenance problems at the same time. Using rehabilitation of part of the fleet instead of replacing the buses is an effective way to break up the replacement cycle and schedule future replacements more efficiently. This is sometimes referred to as fleet age balancing.

Buying Versus Rehabilitation

In addition to considering all of the above factors to determine whether rehabilitation might be appropriate, the final choice must be a financial decision. Is the money available? If enough is available, which option is the most cost effective? Life-cycle costing is a valuable tool to use when making this final analysis. The life-cycle cost (LCC) is the sum of the purchase price, operating costs, and maintenance costs, minus the resale value when the vehicle is disposed. In the following examples, we will demonstrate how to use simple LCC formulas to compare purchasing new buses with rehabilitating old buses.

LCC example formulas. This first example assumes that rehabilitation will only increase the service life of the 12 year old bus by five years; the second example assumes an extension of eight years. In both examples, two simplified formulas are used to determine the life-cycle cost. The formula to determine the LCC for purchasing a new bus and replacing it with a new bus whenever it deteriorates past the point of usefulness is:

$$LCCn = \frac{T}{Ln} \quad [Cn + (On \times Ln) - Rn]$$

where:

T = term of analysis

Ln = useful life of new bus

Cn = purchase cost of new bus

On = operating and maintenance cost of new bus/year

Rn = resale value of bus after its useful life

The formula for purchasing a new bus and rehabilitating it at the end of its normal useful life (only one time) is:

$$LCCr = \frac{T}{Ln + Lr} [(Cn + Cr) + (On \times Ln) + (Or \times Lr) - Rr]$$

where, in addition to the above:

Lr = useful life of a rehabilitated bus

Cr = cost of rehabilitating a bus

Or = operating and maintenance cost of a rehabilitated bus/year

Rr = resale value of rehabilitated bus after its extended useful life

Example one: five-year extended life. For this example we assume the following data.

T = 34 years

Ln = 12 years

Lr = 5 years

Cn = $170,000

Cr = $65,000

On = $14,000

Or = $16,000

Rn = $10,000

Rr = $4,000

$$LCCn = \frac{T}{Ln} [Cn + (On \times Ln) - Rn]$$

$$= 34/12\ [170{,}000 + (14{,}000 \times 12) - 10{,}000]$$

$$= 34/12\ (328{,}000)$$

$$= \$929{,}333$$

$$LCCr = \frac{T}{Ln + Lr} \quad [(Cn + Cr) + (On \times Ln) + (Or \times Lr) - Rr]$$

$$= 34/(12 + 5) \quad [(170{,}000 + 65{,}000) + (14{,}000 \times 12) + (16{,}000 \times 5) - 4{,}000]$$

$$= 34/17 \quad (235{,}000 + 168{,}000 + 80{,}000 - 4{,}000)$$

$$= 2 \quad (479{,}000)$$

$$= \$958{,}000$$

Example two: eight-year extended life. For this example, we assume the following data.

T = 32 years

Ln = 12 years

Lr = 8 years

Cn = $170,000

Cr = $70,000

On = $14,000

Or = $16,000

Rn = $10,000

Rr = $3,000

$$LCCn = \frac{T}{Ln} \quad [Cn + (On \times Ln) - Rn]$$

$$= 32/12 \; [170{,}000 + (14{,}000 \times 12) - 10{,}000]$$

$$= 32/12 \; (328{,}000)$$

$$= \$874{,}667$$

$$\text{LCCr} = \frac{T}{\text{Ln} + \text{Lr}} [(\text{Cn} + \text{Cr}) + (\text{On} \times \text{Ln}) + (\text{Or} \times \text{Lr}) - \text{Rr}]$$

$$= 32/(12 + 8) (170{,}000 + 70{,}000) + (14{,}000 \times 12) + (16{,}000 \times 8) - 3{,}000]$$

$$= 32/20 (240{,}000 + 168{,}000 - 3{,}000)$$

$$= 32/20 (533{,}000)$$

$$= \$852{,}800$$

Analysis. In example one, we used a period of analysis of 34 years. This period allowed us to include two complete cycles of purchasing a bus, using it for 12 years, and rehabilitating it for another five years. When using only new buses, the period of analysis covers two and two-thirds 12 year periods of a new bus's useful life. The factors [T/Ln and T/(Ln + Lr)] are used to adjust these time periods in the formula. The LCC for using new buses and using rehabilitated buses can be compared within each example, but the costs cannot be compared between examples one and two because the terms of analysis are different (34 years compared to 32). In example two, we used 32 years because it conformed nicely to one 12-year period of a new bus, followed by an extension of eight years for one rehabilitation, and followed by one more 12 year period with a new bus. If only new buses were purchased and used, the period of analysis would cover the useful life of two and two-thirds buses. Any appropriate time period may be used for analysis, but it is more convenient to use a period which directly coincides with some milestone in the cycle (e.g., replacing or rehabilitating a bus). The costs can also be analyzed by dividing the LCC by the number of years in the period to create an annualized cost.

In example one, the option using exclusively new buses was $28,667 less than the life-cycle cost of purchasing a new bus and rehabilitating it for five years. In example two, the life cycle cost for the rehabilitation option was $21,867 less than the new bus option. Most of the cost assumptions were the same in both examples, but there were some important differences that account for the different results. The most important difference is the fact that the extension of service life due to rehabilitation in example two was eight years and it was only five years in example one. Even though the rehabiliation cost more ($70,000 as opposed to $65,000), the extension of three additional years was more than worth the extra expense, and this fact made rehabilitation more cost effective than strictly purchasing new vehicles. The older age of final retirement (20 instead of 17) reduced the resale value from $4,000 to $3,000, but this difference was insignificant.

When looking at a life-cycle cost difference of only $21,867 over 32 years, it may be tempting to choose new buses simply because they exhibit a more attractive image to the general public. It is also important to note that this cost is not discounted to reflect the time value of money, which would further reduce the financial impact. The system's image can be a very important factor in attracting ridership and generating local income and must also be considered as a factor when considering a decision to rehabilitate. The convenience of only stocking one type of maintenance inventory is also a big advantage for purchasing only new buses. However, the $21,867 savings is only for one bus. In capital replacement programs involving large numbers of vehicles, these cost savings quickly multiply into large savings.

Tax Benefit Transfer (Safe Harbor Leasing)

Tax benefit transfer or "safe harbor leasing" is a mechanism through which the transit industry can realize a substantial financial benefit. Essentially Congress has created an additional subsidy for the transit industry by creating a tax break for private investors that also reaps benefits for transit systems. A transit system cannot take advantage of a tax break becuase it does not pay taxes, so it sells the right to use the tax advantage to a private corporation. However, there are many complications to overcome before a successful agreement can be arranged. This complexity has discouraged many eligible participants from attempting the process.

Background

Safe harbor leasing was originally created as an incentive to private industry. Tax exempt entities sold depreciation rights of capital equipment which they could not benefit from because of their tax status (e.g., a corporation loses money and therefore owes no taxes), to private industries which could benefit from their depreciation rights by lowering their tax debt. By creating this legal tax loop hole, Congress hoped to stimulate capital investments in private industry. In response to serious economic recession, Congress decided to loosen tax reductions in an attempt to stimulate economic recovery.

The Economic Tax Recovery Act of 1981 (ERTA) considerably relaxed the tax provisions governing leasing and opened safe harbor leasing to many industries, including both public and private sectors. Some of the most profitable private companies in America immediately began taking advantage of the opportunity. The Treasury Department estimated that they would lose $27 billion in tax revenues by 1986 because of this single element of ERTA. Growing concern about an increasing federal deficit and this significant loss of potential revenue caused Congress to reconsider the entire tax benefit transfer issue. The Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) essentially killed safe harbor leasing for all interests at the end of 1983, except for the transit industry. Safe harbor leasing is still available to the transit industry until the end of calendar year 1987. Because of the long procurment times for some transit vehicles, especially rail cars, special exceptions were included to allow vehicles going into service after January 1, 1988 to be eligible as long as certain special conditions were met by March 31, 1983.

Description

In order to arrange a safe harbor leasing agreement with a private firm, a transit system must be in the process of purchasing motor buses, rail cars, or some sort of rolling stock. The transit system, being a public body, pays no taxes; therefore, it cannot take advantage of depreciation rights and tax advantages of the purchase. The transit system must find a private firm that is having a profitable year and is interested in purchasing the depreciation rights of the vehicles. The vehicles start to depreciate immediately upon receipt, so it is essential for both parties to begin the transactions as soon as possible.

The transit system sells the depreciation rights to a private firm and receives a one-time, lump sum payment. In order to meet the at-risk requirements of ERTA, the lump sum payment must equal or exceed 10% of the value of the eligible rolling stock. According to Treasury Department regulations, depreciation rights can be sold only on the nonfederal share of the purchase. The benefits the transit system receives from the agreement is the lump sum payment along with maintaining title and control of the rolling stock. The private corporation receives substantial tax benefits from the transfer. At the end of the safe harbor leasing period, the purchaser returns all rights to the buses or rail cars to the transit system for a fee of $1.00.

As the name safe harbor leasing implies, this agreement is not merely a purchase of depreciation rights. There is also a lease agreement involved. After the private corporation purchases the depreciation rights, it then leases the vehicles to the transit system, although the title never changes hands. After the down payment has been paid, the private corporation must also continue to pay the rest of the purchase price plus interest in equal-sized payments over the life of the lease. Meanwhile, the transit system pays a rental fee equal to the payments received from the private firm. This convenient arrangement of equal payments eliminates the need for an exchange of actual cash. It is purely a paper transaction. Therefore, money only changes hands twice during the entire lease agreement: once with the initial down payment made by the private firm, and a second time when the transit system repurchases the vehicles for $1.00 at the end of the lease period.

Benefits

The advantages of a safe harbor lease to the transit system are clear. The transit system keeps possession of the vehicles and receives an initial down payment of at least 10% of the nonfederal share of the purchase price. The down payment less any legal or financial fees, which can be substantial, is the actual benefit that the transit system will receive.

The advantage to the private firm is harder to determine. The depreciation from the vehicles can be deducted from the firm's taxable income, thus reducing the firm's tax payments. Because of the special consideration given transit rolling stock under ERTA, the private firm is allowed to use the Accelerated Cost Recovery System (ACRS). Use of ACRS allows the private firm to benefit even more by having the depreciation applied to taxable income during the first five years instead of using straight line depreciation (the sooner the depreciation rights are sold, the greater the net present value). Although no money exchanges hands after the down payment, the IRS recognizes the rental payments as income to the private firm and recognizes the payments to the transit authority as eligible for interest deductions. The net effect of each transaction is the private firm must pay additional taxes on the amount of each payment which is used to reduce the principal. This amount increases each year as the interest portion of each payment declines. Overall, the advantage to the private firm is the net present value of the tax savings associated with the depreciation less the net present value of the increased taxes associated with the principal reductions less the initial down payment less any legal and financial fees required for the lease.

Safe Harbor Leasing Example

The following example is simplified, step-by-step outline of the process, payments, and financial gains of a safe harbor leasing agreement to both a transit system and a private firm. It was necessary to make certain assumptions and to simplify some steps to make the process easier to understand.

1. A transit authority buys buses worth \$100,000,000 of which UMTA pays 80% and the nonfederal share is 20%. Therefore, \$20,000,000 worth of buses are eligible for a safe harbor lease.

2. The transit authority and a private firm agree on a safe harbor lease arrangement. The private firm will make a down payment of \$2,000,000. The interest rate on the principal will be 12% per year and the life of the lease is 15 years.

3. Since the remaining purchase price of \$18,000,000 (\$20,000,000 - \$2,000,000) must be repaid in 15 equal, annual installments at 12% interest. See Table 9.2 to get an annuity factor of 6.811 (15 years at 12%). The annuity payment is:

$$\$\,\frac{18{,}000{,}000}{6.811} = \$2{,}642{,}783.73$$

   or for our purposes, \$2,642,800.

4. The private firm will depreciate the buses under ACRS. (Percentages are standard for five-year ACRS depreciation.)

Year	Standard Percentage	Depreciation Amount
1	15%	$3,000,000
2	22%	$4,400,000
3	21%	$4,200,000
4	21%	$4,200,000
5	21%	$4,200,000

5. While the private firm is paying $2,642,800 per year for the depreciation rights of the buses, the transit authority pays an annual rental fee of $2,642,800.

6. The benefit to the transit authority is the $2,000,000 down payment and the full use of the buses for 15 years with the option of buying back the buses for $1.00 at the end of the agreement (less any legal or financial fees, which are not included in this example).

7. The benefit to the private firm is harder to calculate. The net present value of the depreciation rights before taxes is $15,937,000, or $7,331,000 after taxes (assuming a 46% corporate income tax rate). However, taxes are increased every year by the principal reduction part of each annual payment, which has a net present value of $6,467,600 before taxes, or $2,975,000 after taxes. Also, the private firm paid the initial $2,000,000 down payment. The total benefit to the private firm is:

   $7,331,000 - $2,975,000 - $2,000,000 = $2,356,000.

8. It should be noted the monetary gain for both the transit authority and the private firm will be lower due to legal and financial fees.

Table 9.3 provides a more detailed description of the financial implications of the Safe Harbor Leasing. The table breaks down the costs and benefits year by year throughout the 15-year sale/leaseback period.

Each of the 13 columns in Table 9.3 is described below.

Column 1. Identifies the year, or the payment periods of the sale/leaseback agreement. The first row, identified as 0, describes the transactions which take place at the beginning of the agreement. Each consecutive number identifies the transactions at the end of the corresponding year.

Column 2. Depreciation percentages are standard for ACRS. The five-year depreciation schedule is 15%, 22%, 21%, 21%, and 21% for each consecutive year.

Column 3. Actual depreciation discounted at 12% over the five years of ACRS yields the net present value of the purchased depreciation rights, before taxes.

TABLE 9.3 Safe Harbor Leasing Example (in millions of dollars)

1	2	3	4	5	6	7	8	9	10	11	12	13
Year	Depreciation			Rental Payments Received	Debt Service					Principle	Down Payment	Total Yearly Tax Savings (Cost)
	Actual	Discounted	Yearly Tax Savings (Cost)		Total	Interest Paid	Principle Reduction	Principle Reduction (Discounted)	Yearly Tax savings (Cost)			
0	3.0000	3.0000	1.3800	——	——	——	——	——	——	——	(2.0000)	(.6200)
1	4.4000	3.7290	1.8073	2.6428	2.6428	2.1600	.4828	.4311	(.1983)	18.0000	——	1.3414
2	4.2000	3.3470	1.5396	2.6428	2.6428	2.1021	.5407	.4309	(.1982)	17.5172	——	1.6090
3.	4.2000	2.9900	1.3754	2.6428	2.6428	2.0372	.6056	.4312	(.1984)	16.9765	——	1.1770
4.	4.2000	2.6710	1.2287	2.6428	2.6428	1.9645	.6783	.4314	(.1984)	16.3709	——	1.0303
5	——	——	——	2.6428	2.6428	1.8831	.7597	.4307	(.1981)	15.6926	——	(.1981)
6	——	——	——	2.6428	2.6428	1.7920	.8508	.4314	(.1984)	14.9327	——	(.1984)
7	——	——	——	2.6428	2.6428	1.6899	.9529	.4307	(.1981)	14.0821	——	(.1981)
8	——	——	——	2.6428	2.6428	1.5755	1.0673	.4312	(.1984)	13.1292	——	(.1984)
9	——	——	——	2.6428	2.6428	1.4474	1.1954	.4315	(.1985)	12.0619	——	(.1985)
10	——	——	——	2.6428	2.6428	1.3040	1.3388	.4311	(.1983)	10.8665	——	(.1983)
11	——	——	——	2.6428	2.6428	1.1433	1.4995	.4304	(.1980)	9.5277	——	(.1980)
12	——	——	——	2.6428	2.6428	.9634	1.6794	.4316	(.1985)	8.0282	——	(.1985)
13	——	——	——	2.6428	2.6428	.7618	1.8810	.4307	(.1981)	6.3488	——	(.1981)
14	——	——	——	2.6428	2.6428	.5362	2.1066	.4319	(.1987)	4.4678	——	(.1987)
15	——	——	——	2.6428	2.6428	.2833	2.3595	.4318	(.1986)	2.3612	——	(.1986)
TOTAL												
	20.0000	15.9370	7.3310	39.6420	39.6420	21.6420	18.0000	6.4676	(2.9750)	0	(2.0000)	2.3560

NOTE: Interest rate = 12%. Corporate income tax rate = 46%

Column 4. Yearly tax savings come not from the depreciation rights, but from the taxes you can avoid paying because of them. Based on a 46% corporate income tax rate, this column shows the yearly tax savings.

3.000 x .46 = 1.3800

Column 5. Rental payments are established to equal the debt service payments so that it is not necessary for money to actually change hands.

Column 6. Debt service payments are established by dividing the beginning principal by the present value factor from Table 9.2.

\$18,000,000 ÷ 6.811 = \$2,642,783.73, or

18.0000 ÷ 6.811 = 2.6428

The present value factor is found on Table 9.2 at the intersection of the row for the number of periods to be paid (15 annual payments) and the column for the interest rate (12%).

Column 7. To determine the amount of interest paid, first compute the principal reduction (column 8); then subtract it from the total debt service payment.

2.6428 - .4828 = 2.1600

Column 8. To determine the amount of principal reduction, multiply the beginning principal times the interest rate and add it to the principal.

18.0000 x .12 + 18.0000 = 20.1600

Subtract the annual payment from the above total

20.1600 - 2.6428 = 17.5172

This difference (17.5172) gives you the new principal which goes in column 11. Subtract the new principal from the old principal to get the principal reduction.

18.0000 - 17.5172 = .4828

Column 9. To determine the present value of the principal reduction, multiply the principal reduction times the present value factor for 12% interest at each corresponding year from Table 9.1.

.4828 x .893 = .4311

.5407 x .797 = .4309

Column 10. To determine the present value of yearly tax savings, multiply the discounted principal reduction times the corporate income tax rate.

$$.4311 \times .46 = .1983$$

Column 11. The principal was already determined as an intermediate step in column 8.

Column 12. The down payment is a one-time event at the beginning of the sale/leaseback period.

Column 13. The total yearly tax savings are determined by the following: yearly tax savings due to depreciation less yearly tax savings due to debt service less down payments.

$$1.3800 - 0 - 2.0000 = -.6200$$

$$1.8073 - .1983 - 0 = 1.6090$$

CHAPTER TEN

AUTOMATION

Introduction

The rapidly changing technology in the area of computers has increased the number and range of tools available to the financial manager. A full spectrum of calculating devices is now readily available, ranging from hand-held calculators to mainframe computers that occupy a full, climate-controlled room. The abilities of these machines and their prices also vary proportionately. An appropriate tool is available to assist financial managers in almost any size or type of organization.

The abilities of these machines also vary on a spectrum. The three major factors that change are:

1. The amount of data that they can store.
2. The number and complexity of instructions that they can store in the form of a program.
3. The speed with which they can perform calculations.

At one extreme, a calculator can be used to perform calculations, but can store a limited amount of data (usually less than six numbers). It cannot store instructions at all and is limited by the speed of the user. At the other extreme, a mainframe computer can store large amounts of data and lengthy programs, and can perform the desired calculations very rapidly. This means that the user can give the computer a maximum of specific instructions about the task it is to perform. Between these extremes, microcomputers and minicomputers offer a range of machines more or less independent of instructions from the user.

Automating financial functions, like any other computer application, requires selecting two parts to a computer system. First, the software or program that actually does the job must be selected. Second, the computer or machine that will run the selected program must be chosen. The software selection is the more critical of the two and actually determines the usefulness of the computer system.

One of the more confusing issues in selecting computer software and hardware is in identifying the appropriate number of users of the system and the amount of coordination that must be provided between them. Each user can have their own programs and small computer (a single-user system), or a single program and computer can be used by numerous people (a multi-user system). A multi-user system requires a faster, and therefore more expensive, computer to be able to handle the requirements of several users simultaneously. Different software and hardware are required for the two different approaches.

Uses of Automation in Financial Management

The uses of automation in financial management fall into two general categories:

1. Routine tasks requiring calculations, involving storage, updating records and manipulation of records, can be programmed for repetition by the computer. This avoids the need to repeat tedious tasks by hand and enhances the reliability of results. Examples of these tasks include accounting, inventory, and report preparation. Most of these applications are either accounting functions or compiling and updating records.

2. One-time or infrequent analysis may be required as an input to decision-making. The computer can be used to help organize complex calculations, and perform repetitious calculations rapidly. Examples of this include analysis of proposed fare changes, cash management strategies, and budget development.

Accounting

Accounting functions, which require continual organization of information, repetitious calculations, and preparation of routine reports, are a natural application for computers. Preprogrammed accounting packages are readily available, and fall into two general categories: those designed for any small business, and those specifically designed for transit operations.

Business accounting packages. Generic business accounting packages are available for all size businesses, either from office automation companies (for larger operations and computers) or increasingly "off-the-shelf" from computer stores for small computers. These usually consist of five elements that are designed to be used together, but that can be purchased as separate modules.

-General ledger
-Accounts payable
-Accounts receivable
-Payroll
-Inventory

A change or correction in one module should be automatically incorporated when it affects the other modules.

The modules of most use to the typical transit agency are the general ledger and accounts payable. Accounts receivable may be required in an agency with extensive pass sales or charter work. The payroll module might need to be revised if an exception-based payroll system is in use; many agencies using a service agency may gain little advantage from moving the process in-house, while becoming responsible for producing the paychecks punctually. Finally, many inventory modules are designed for retail inventory rather than stockroom control; for example, they may not incorporate reordering thresholds, nor multiple suppliers.

Because these programs were written for any small business they may not be able to meet the special needs of transit operations. It is important to check that a package has the flexibility to perform as required. First, the standard reporting required by Section 15 has some impact on program selection. Can the program use 10 digit account codes? Can reports be formatted to fulfill the Section 15 requirements? A second consideration in selecting an accounting package concerns the amount of flexibility. Can you reformat reports to your own requirements? If not, will the supplier make modifications for you? Programs written in database management languages may be easier to modify.

Transit accounting packages. Transit specific financial packages are available from a number of consultants and software development companies. These programs tend to be more expensive than general business packages because of the work required to tailor them to transit's specific needs, and because of the relatively small number of potential customers.

These packages are usually provided as a turn-key system by the supplier; the supplier provides the software and hardware, as well as training, installation and support of the system. In this case, the user often has very little idea how the programs organize the data or work, little flexibility to make modifications themselves, and how they are forced to rely on the supplier for these services.

The best source of information on these programs, as on many other specialized programs, is other agencies who are using the program. In addition to agencies provided as references by the supplier, users can be identified through the American Public Transit Association (APTA), through the Transit Industry Microcomputer Exchange (TIME), or through the Urban Mass Transportation Administration (UMTA). Talking to the individuals who actually use the programs may provide you with a clearer understanding of what the programs actually can do for you, how they would fit into your organization and operating procedures, and what is the quality of program itself and the supplier's support.

Data Storage And Retrieval

There are many tasks in financial management for transit that are primarily problems of data filing, organizing, and retrieving. Some of these tasks are fixed asset and parts inventory, personnel and payroll data maintenance, and summary of farebox revenue. Accounting functions are also a specialized application of this type.

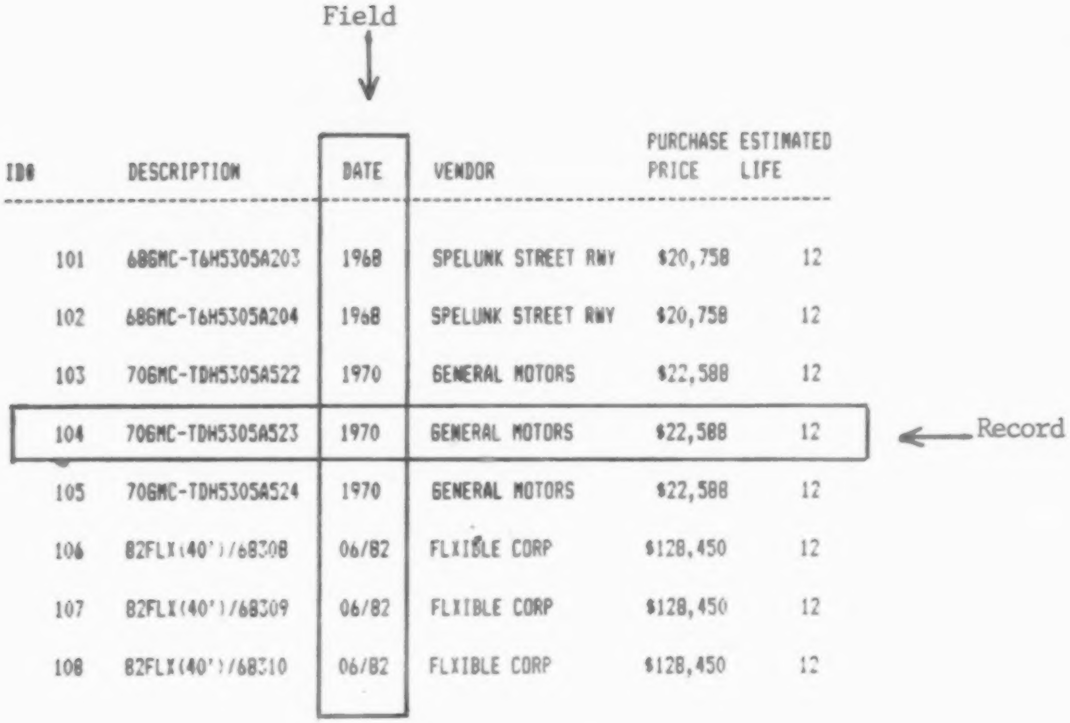
Many of these tasks can be done using a general purpose database management program. Database managers make use of the computer's ability to store and manipulate large amounts of information quickly. The purpose of the database manager is to structure the information in such a way that it becomes accessible through the computer, and to provide powerful commands to perform data manipulations in one step, such as sorting or finding data. These programs can help the user to perform any task that can be structured as though it were a set of file cards ontaining data to be updated or manipulated.

The heart of a database system is the way the information is structured. Microcomputer databases are structured as a set of files (or relations), each consisting of records, which are in turn made up of fields (or attributes). A file is analagous to a paper file containing, for example, information on each part in inventory, or payroll data for all employees, and can be imagined as a large table. Files are the units in which data is stored on disks. Each file is composed of a number of records, each containing data for one part or one employee, and all structured in exactly the same way, like a preprinted form. Each piece of information in the record, such as the data of last order of the part, or current run number of the employee, is called a field. Figure 10.1 illustrates the relationship between these elements.

The key to database implementation is defining the structure and interrelationships of the datafiles. This requires a thorough understanding of the means of collecting and the uses of the data, the manipulations that might be desired, and the capabilities of the program being used. A well organized manual record keeping system may be transferred fairly directly to a database manager. Substantial procedural changes may be required in a system that currently maintains disorganized or incomplete information.

The potential benefits of database management are enormous. The time required to perform routine summaries of information, or to locate a particular piece of information can be reduced. This makes it feasible to summarize the data in ways that can help decision-makers, but that were not possible before, due to the time required. This capability may increase the amount of data available to managers in planning and decision-making.

Because of the complexity of database management, it is possible that you may find it effective to hire a programmer to work with you in setting up the database system. It may be to your benefit to use the experience and perspective of an outside programmer, not only because



ID#	DESCRIPTION	DATE	VENDOR	PURCHASE PRICE	ESTIMATED LIFE
101	68GMC-T6H5305A203	1968	SPELUNK STREET RWY	$20,758	12
102	68GMC-T6H5305A204	1968	SPELUNK STREET RWY	$20,758	12
103	70GMC-TDH5305A522	1970	GENERAL MOTORS	$22,588	12
104	70GMC-TDH5305A523	1970	GENERAL MOTORS	$22,588	12
105	70GMC-TDH5305A524	1970	GENERAL MOTORS	$22,588	12
106	82FLX(40')/68308	06/82	FLXIBLE CORP	$128,450	12
107	82FLX(40')/68309	06/82	FLXIBLE CORP	$128,450	12
108	82FLX(40')/68310	06/82	FLXIBLE CORP	$128,450	12

FIGURE 10.1 Database example: fixed asset inventory.

of the technical aspects of using the program, but also the issues concerned with designing the files and interrelationships between them in the context of day-to-day transit operations. Once the database has been set up, however, no particular computer expertise should be required to sort the data, look at it, generate data summaries, or design reports showing selected information.

Management Support and Analysis

A very different application of computer technology from those discussed above is as a tool for one-time analysis of data. This type of analysis is often needed when predicting the impact of alternative decisions. A better understanding of possible impacts of a new fare policy, for example, can be obtained. The expected impacts of a range of cash management strategies can be compared.

The electronic spreadsheet can provide a versatile and powerful tool for this type of analysis. It allows the user to structure a problem in a general way that can then be used to test various scenarios. This process can be applied to any problem that can be imagined as a large table of labels and interrelated values.

The electronic spreadsheet is a large table with rows and columns of cells. The user may place a number, a label, or a formula in each cell. The formulas may include values from other cells, and it is this that makes the spreadsheet so effective. When a value that is used in other formulas is changed, the results of the dependent formulas are automatically recalculated.

Figure 10.2 shows a simple example of a spreadsheet. In this case the fuel consumed by each fleet is known, and the user wants to know the cost of the fuel. When the spreadsheet is set up, the formula " B6*C6 " is entered in cell D6. (Multiplication is indicated by an asterisk *.) From then on, the spreadsheet will display the result of the calculation in cell D6, in this case 65,000 multiplied by .91 or $59,150 is the amount of consumed fuel. If the projected fuel cost in cell C6 is changed, or the amount of fuel consumed, the result in D6 will change automatically. The totals for fuel consumed and monthly cost are also included and automatically updated in cells B12 and D12 respectively. (e.g., cell D12 is the summation of D6 + D8 + D10).

This fundamental concept allows computational problems to be displayed visually as steps in a table, making the problem easier to understand and resolve. The spreadsheets provide numerous commands that help the user to set up the application and create a table that is understandable and suitable for presentation. For example, the commands allow the user to copy a formula from one cell to a number of others, or to set the format of numbers displayed as integers, real numbers with a selected number of decimal places, or even dollars. Functions such as average, maximum, or net present value are also provided for use in the formulas.

Row	A	B	C	D
1		Fuel	Price	
2		Consumed	Per	Monthly
3	Fleet	(gallons)	Gallon	Cost
4				
5				
6	40' Buses	65,000	$.91	$59,150
7				
8	30' Buses	25,000	$.91	$22,750
9				
10	Service Vehicles	4,500	$.96	$ 4,416
11				
12	Total	94,500	--	$86,316

FIGURE 10.2 Spreadsheet example.

The applications for spreadsheets are virtually unlimited. They permit rapid calculation of outcomes for a range of input values by a sophisticated process of trial and error. Tables of interrelated values, such as budgets and performance measures, may be rapidly changed or updated. Small amounts of data may be organized and manipulated. As a result, spreadsheets have become the most frequently used type of microcomputer software.

Frequently used applications of spreadsheets in financial management include:

- Operating budget development
- Cash flow management
- Fare structure analysis
- Preparation of monthly reports

Examples of these applications are included in Appendix B.

Other Financial Programs

There are numerous other computer programs available for financial analysis and problem-solving. Many of them are proprietary programs that are available from their developer. The development of some programs for microcomputers has been sponsored by UMTA, resulting in a public domain product that is available at no cost; these programs are distributed through the Transit Industry Microcomputer Exchange (TIME), whose address is given below.

The Driver Extraboard Cost Model (DEB) can be used to forecast driver wage and benefit costs by month for a five-year period. The model takes into account changes in amount and profile of service, hiring and layoffs of drivers, unscheduled and unproductive pay hours, and estimates of cost of living allowance (COLA) increases, if applicable.

A transit personnel/payroll reporting system is also available. The program is used to enter daily reports of work hours and absenteeism in a cumulative record of payroll and leaves. This program is written using a database manager, which allows the user to summarize the data in various ways as required.

There are other associations, outside the transit industry that can provide public sector application programs of a financial nature. The Government Finance Officers Association sponsors a research center which has developed software for various financial functions, such as: sizing bond offerings; deciding where to buy, borrow, or lease; assessing financial condition; and forecasting revenues.

Sources of Information

An inventory of all software on computers at transit agencies is being conducted for the National Cooperative Transit Research and

Development Program (NCTRP). For information on the status of this project contact:

Mr. Ian Kingham
Projects Engineer
Transportation Research Board
2101 Constitution Avenue, N.W.
Washington, D.C. 20418
(202)335-3224

UMTA produces publications on the use of microcomputers in transit operations. Currently available documents include:

Selected Readings, Volume 1, Getting Started in Microcomputers

Selected Readings, Volume 2, Selecting a Single User System

Selected Readings, Volume 3, Addressing Organizational Issues

Software and Source Book (Updated periodically)

The Transit Industry Microcomputer Exchange is a federally sponsored microcomputer users group. They publish a newsletter, "TIME Capsule",

TIME Support Center
Rensselaer Polytechnic Institute
Civil Engineering Department
Troy, NY 12181
(518) 266-6227

In addition to these formally defined sources, the most valuable source of answers to your questions is probably your peers at systems similar to your own. A site visit, or conversation with users of computers for applications you are interested in can provide a better understanding of the real day-to-day issues faced in implementing and using a computer than any other source.

APPENDIX A

DEBT MECHANISMS

Anticipation Notes

Revenue

Use: In anticipation of UMTA Section 5 operating assistance.

Agency: Orange County Transportation District (OCTD).

Date: 1983.

In order to make up a shortfall in funds due to the time delay of up to a year in receiving UMTA Section 5 operating assistance funds the OCTD issued revenue anticipation notes. Since the OCTD is non-profit and tax exempt it was able to borrow at tax exempt rates. The notes received a rating of M1G1, which is the highest possible for short-term loans. The proceeds from the notes were combined with city and special district funds so that the excess working capital could be invested at higher taxable interest rates. The difference of 3-4% between tax exempt and taxable rates will yield a profit depending on the amount of money involved.

The approval of the Internal Revenue Service and the Orange County Board of Directors was necessary to issue the notes. The notes were secured by OCTD funds for a higher rating but were timed to the receipt of the Section 5 grants. Grant anticipation notes may be issued for up to 13 months in advance. Although this transaction was in anticipation of Section 5 operating assistance, the same procedures are possible for Section 9 operating assistance.

Bond

Use: In anticipation of capital improvement bonds.

Agency: Greater Cleveland Regional Transit Authority (GCRTA).

Date: 1984.

The notes were issued for one year at 8.05% interest. The arrangements to handle the notes were made with two Cleveland security brokers.

The proceeds from the Capital Improvement Bond Anticipation Notes were to be used to provide a match to funds provided by UMTA. The monies will be used to fund a capital improvement program.

Grant

Use: Anticipation of UMTA Grants.

Agency: Port Authority of Allegheny County (PAT) in Pittsburgh.

Date: 1981.

The Port Authority of Allegheny County used a financing program developed by the New York office of Paine Webber Capital Markets to continue funding of capital projects underway while waiting for UMTA grants. The problem that PAT faced is common to many transit agencies. The waiting time for grant money delays construction and increases costs. Delays are particularly costly in times of high inflation or when timing of various stages of construction is critical and delay will cause additional cost. In order to prevent expensive delays the transit agency staff worked with Paine Webber to implement a new use of advance construction notes. PAT pledged the debt would be paid with the grant money. The offering raised enough money to keep the project moving until grants arrived from UMTA.

Advance construction notes are best suited for projects lasting several years. The advanced financing is not likely to succeed when work has already begun, but transit agencies should be able to sell the notes for new projects.

Zero Coupon Bonds

Use: Capital investments, new rail lines, buses, etc.

Agency: Massachusetts Bay Transportation Authority (MBTA).

Date: 1982.

The Massachusetts Bay Transportation Authority issued $8.2 million in zero coupon tax free bonds as part of a larger bond issue. The MBTA and its underwriters claim that the zero coupon bonds sold like "hotcakes." They were priced at $17.00 per $1000 to give a yield of 8.25% to the investor. MBTA saved $6.9 million in interest payments over the life of the bond project by employing the zero coupon innovation.

The use of zero coupon bonds may be limited by the size of the investment market interested in this kind of arrangement. The yield of zero coupon bonds has been lower then the rate for conventional municipal bonds. In 1982, zero coupons were 5-6% lower than conventional municipal bonds. However, these bonds were designed to reach the special market of small, less risky investors which includes people with very little cash to invest, people interested in starting long term education accounts for their children, etc. This special market, which is small in size, is easily saturated. Also, because bonds are sold at cheaply discounted prices, the municipality must sell two or three times their par value in order to raise the desired amount of funds.

The MBTA estimates that it will save $6 million in interest payments using zero coupon, as opposed, to conventional bonds. Additionally, zero coupon bonds effectively transfer the yearly debt service cost of alternative financing techniques into a lump sum capital payment in the future.

Certificate of Participation

Use: Purchase new buses

Agency: Southern California Rapid Transit District

Date: 1980

Procedure

The Southern California Rapid Transit District (SCRTD) raised $29 million towards the purchase of 1,000 new buses by selling 10-year equipment trust certificates at 8% to private investors. The certificate holders have title to 20% or 200 buses and are leasing them back to SCRTD for an annual amount equal to one-tenth of the principal and 100% of the debt service on the certificate (interest). An investment banking firm selected through competitive bidding sold the certificates to a group of investors. A bank was named by SCRTD to act as trustee for the certificate holders.

Backing of Certificates

1. The buses served as collateral.

2. A cash reserve fund was established which must equal 25% of the principal amount of the outstanding certificates.

3. An insurance policy was purchased which raised the equipment trust certificate's credit rating from BAA to AAA which saved approximately $2 million in interest payments.

UMTA Involvement

There was a delay of over one year while UMTA determined whether the federal government could finance 80% of the capital cost of the equipment through a normal UMTA grant. Under normal circumstances UMTA would own an 80% interest in each of the buses. UMTA agreed that its 80% grant entitled it to own 100% of 800 buses and that the certificate holders owned 100% of 200 buses.

Financial Results

SCRTD sold $29 million worth of certificates very quickly and subsequently deposited $7.5 million or (25% of the $29 million) in the "Collateral Equalization Reserve Fund." This fund protects the certificate holders' interest against fluctuations in the anticipated market value versus the original market value of the buses. It is similar to the reserve requirement on most debt instruments and also enabled SCRTD to earn interest from the Collateral Equalization Reserve Fund.

Under normal circumstances a transit agency would receive a very poor credit rating on any debt instrument since farebox revenues are insufficient to cover operating expenses. A poor credit rating means that SCRTD would have to pay a higher interest rate on the debt. However, a consortium of insurance companies including Aetna and Travelers have formed a company called MBIA to provide added insurance for debt instruments such as equipment trust certificates. In this transaction, SCRTD purchased an MBIA insurance policy for .03% of the total value of the equipment. Standard and Poors will automatically provide an AAA bond rating for any debt instrument secured by an MBIA policy.

Lease Purchase Agreement

Use: Purchase new and rehabilitated buses.

Agency: Metropolitan Transit Authority (MTA) of Houston, Texas.

Date: 1981

The Metropolitan Transit Authority (MTA) entered into a lease-purchase agreement as part of a larger financing package to purchase eight new GMC buses and 84 rehabilitated ones worth $8.4 million. To lower the total cost of the project, MTA negotiated a safe harbor lease with First City Leasing Corporation to sell the tax depreciation rights associated with the vehicles for $1.2 million. However, before MTA could sign the lease they needed to comply with the safe harbor leasing provision that 5% of the project cost be funded with tax exempt debt.

The solution was to solicit bids for a $5,000,000 lease purchase agreement. The winning bid offered the sum at 11.15% for a five year period. The holders of the winning bid held title to 5% of the buses purchased for five years; at the end of this time they will sell their 5% interest to the MTA for a nominal fee. The final result of their effort was that MTA was able to reduce its initial outlay by $500,000.

APPENDIX B

MICROCOMPUTER APPLICATION EXAMPLES

DOCUMENTATION: OPERATING BUDGET

Application

This template aids in the development of a detailed, period by period, operating budget.

Use

Background assumptions concerning the amount of service offered, and wage and fuel prices, are used to generate budget amounts for service related line items. Other items are entered as estimated, either on an annual or monthly basis.

Notes

The first 30 rows contain background information provided as assumptions in developing the budget.

Rows 31 through 105 contain budgeted line item amounts by monthly period, and annual total.

Rows 107 through 117 contain summary statistics of budgeted performance.

Columns O through Q contain breakdowns of each line item per hour, per mile, and as a percentage of the total budget.

All items are entered as direct monthly estimates (or annual estimates divided by 12) except as follows:

Rows 6 - 9: Data. Number of days of each type of service offered.

Q6 - Q9: Assumption. Projected hours of service offered on each type of day.

Row 10: Assumption. Projected hours of special service offered, such as express, employee trippers, or other.

C12: (C6*Q6+C7*Q7+C8*Q8+C9*Q9+C10)

C13: (C12*Q13)

Q13: Assumption. System-wide average operating speed, miles per hour.

B15: Avg(C15..N15)

C15: Assumption. Average or effective operator wage rate, taking progression, Cost of living adjustments, and wage increases into account.

Q15: Assumption. Platform hours divided by vehicle hours.

B16: Avg(C16..N16)

C16: Assumption. Average or effective mechanic wage rate, taking progression, job categories, COLA and wage increases into account.

C17: (C33+C35)

Q17: Assumption. Gross wages, including paid absences, divided by wages for time worked by bargaining unit employees.

C18: (C34+C36+C37+C38+C39)

Q18: Assumption. Gross wages, including paid absences, divided by wages for time worked by exempt employees.

B20: Avg(C20..N20)

C20: Assumption. Projected price of fuel in dollars per gallon. An increase of $.0066 per gallon per month is assumed for the example.

Q20: Assumption. Allocation factor for assigning a portion of fixed costs to operations.

C21: (C13/3.14)*C20 The example uses an average fuel mileage of 3.14 miles per gallon.

Q21: Assumption. Allocation factor for assigning a portion of fixed costs to non-operating accounts. Q20 plus Q21 should equal 1.

B22: Avg(C22..N22)

C22: Assumption. Projected price of oil in dollars per quart.

Q22: Assumption. Projected cost of parts in dollars per vehicle mile.

C23: (C13*C22)/109 The example uses an oil mileage rate of 109 miles per quart.

C24: (108*4)*C20. The example has four service vehicles consuming 108 gallons each per month.

B26: Avg(C26..N26)

C26: Assumption. Projected average principal balance of outstanding loans in each period.

C27: Assumption. Projected average monthly interest rate for each period.

B29: Avg(C29..N29)

C29: Assumption. Projected monthly revenue productivity in dollars per vehicle hour.

C33: (C12*C15*Q15)

O33: (B33/B12)

P33: (B33/B13)

Q33: (B33/B108). Set format to percent or multiply by 100.

C34: (13000/Q18). Example uses projected monthly salaries of $13,000.

C35: (C6+C7)*8*24.05*C16/Q17. Example uses 24.05 mechanic equivalents, including overtime, and 8 hour days.

C36: (8200/Q18). Example uses projected monthly salaries of $8,200.

C40: Sum(C33..C39)

C43: ((C17*Q17)+(C18*Q18))*0.067

C44: ((C17*Q17)+(C18*Q18)*0.07

C51: (C17*.008)+(C18*.012) Example uses sick rates of .008 day off per day worked for bargaining unit employees, .012 day off per day worked for exempt employees.

C52: (C17*.033)+(C18*.046)

C53: (C17*.043)+(C18*.05)

C54: (C17*.003)+(C18*.004)

C56: Sum (C43..C55)

C67: Sum (C59..C66)

C70: (C21+C23+C24)+(1.4*C23). Example uses 1.4 x oil cost for lube cost.

C73: (C13*Q22)

C75: Sum (C70..C74)

C85: Sum (C81..C84)

C95: Sum (C91..C94)

C98: (C26*C27)

C103: Sum (C101..C102)

C106: (C40+C56+C67+C75+C78+C85+C88+C95+C98+C103)

C107: (C12*C29)

C108: (C106-C107)

C110: (C106/C12)

C111: (C106/C13)

C112: (C107/C13)

C113: (C107/C106)

C114: (C107/.508). Average fare in example is $.508.

C115: (C114/C12)

Variations

The template presented here can be varied to incorporate the expense line items, accounting periods, and service characteristics applying at each property.

As presented here, system-wide averages are used for operating speed, revenue productivity, parts costs, and other assumptions. These could be broken down by type of service if desired, or included as monthly background data, permitting variations by period.

	A	B	C	D	E	F	G	H
1							OPERATING BUDGET:1984	
3		TOTAL	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
5	BACKGROUND DATA							
	WEEKDAYS, SCHOOL	200	21	20	23	21	21	18
7	WEEKDAYS,NO SCHOOL	55	0	0	0	0	0	4
	SATURDAYS	53	5	4	4	5	4	4
9	SUNDAYS,HOLIDAYS	57	5	4	4	4	6	4
	SPEC.SVCE, VEH HRS	1560	130	130	130	130	130	130
11								
	VEH HRS,TOT	154172	13238	12226	13735	13077	13059	13000
13	VEH MI,TOT	1743274	149589	138154	155206	147725	147567	146910
15	OPER RATE,EFF	8.94	8.49	8.64	8.54	8.54	8.94	8.94
	MECH RATE,EFF	8.76	8.02	8.22	8.22	8.22	8.89	8.89
17	WAGES,HRS WKD,BU	1945237	156516	149520	164383	157863	164563	163962
	WAGES,HRS WKD,EXEMPT	457586	38132	38132	38132	38132	38132	38132
19								
	FUEL UNIT PRICE	1.14	$1.10	$1.11	$1.11	$1.12	$1.13	$1.13
21	FUEL COST	630781	52404	48688	55024	52682	52936	53006
	OIL UNIT PRICE	0.78	$0.71	$0.72	$0.74	$0.75	$0.76	$0.77
23	OIL COST	12403	980	918	1047	1012	1026	1038
	SVC VEH FUEL	5891	475	478	481	484	487	489
25								
	AVG PRIN BAL	291588	291588	291588	291588	291588	291588	291588
27	INT RATE	0.152	0.013	0.013	0.013	0.013	0.013	0.013
29	REV PRODUCTIVITY	13.72	13.76	12.98	13.26	13.55	13.74	13.74
31								

	I	J	K	L	M	N	O	P	Q
1									
3	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER			
5								CONSTANTS	
	0	0	20	21	19	16	VEH HOURS:		[illegible]
7	20	23	1	0	2	5			445
	5	4	4	5	4	5			744
9	6	4	5	5	5	5			165
	130	130	130	130	130	130			
11									
	11740	12401	12836	13238	12778	12948			
13	132662	140131	145047	149589	144791	146312	AVE. SPEED:		11.0
15	8.94	9.15	9.15	9.15	9.15	9.46	PLAT/VEH HRS		1.140
	8.89	9.15	9.15	9.15	9.15	9.46			
17	151120	161746	166283	179477	165678	173125	HRS PD/HRS WKD,SU		1.097
	38132	38132	38132	38132	38132	38132	HRS PD/HRS WKD,SAL		1.112
19									
	$1.14	$1.15	$1.15	$1.16	$1.17	$1.17	ALLOC FACT, OPS		0.894
21	48147	51152	53252	55234	53613	54639	ALLOC FACT, NON-OP		0.126
	$0.78	$0.79	$0.80	$0.82	$0.83	$0.84	PARTS COST PER MIL		0.17
23	950	1018	1070	1120	1097	1129			
	492	495	498	501	504	507			
25									
	291588	291588	291588	291588	291588	291588			
27	0.013	0.013	0.013	0.013	0.013	0.013			
29	13.76	12.49	13.69	14.30	15.21	13.67			
31									

OPERATING BUDGET:1984

	A	B	C	D	E	F	G	H
		TOTAL	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
31	LINE ITEMS							
	SALARIES AND WAGES							
33	50101,010,OPERS	1572083	128125	120421	135284	129764	133092	132491
	50102,010,OP,OTH	140288	11691	11691	11691	11691	11691	11691
35	50102,041,MT,MECHS	370153	28391	29099	29099	29099	31471	31471
	50102,042,MT,ADMIN	88489	7374	7374	7374	7374	7374	7374
37	50102,160,GA,OPS	37047	3087	3087	3087	3087	3087	3087
	50102,160,GA,E.D.	150216	12518	12518	12518	12518	12518	12518
39	50102,160,GA,MKTG	41547	3462	3462	3462	3462	3462	3462
	501 TOTAL LABOR	2402823	194648	187652	202515	198995	202695	202094
41								
	FRINGE BENEFITS							
43	50201,FICA	175762	14240	13770	14816	[illegible]	14829	[illegible]
	50202,RTRMNT	183632	14878	14345	15476	[illegible]	15491	15446
45	50203,HOSP MED	210600	17100	17100	17100	17100	17100	[illegible]
	50204,DENTAL	12810	1035	1035	1035	1035	1035	1035
47	50205,LIFE/AD&D	8460	705	705	705	705	705	705
	50206,DIS	16500	1375	1375	1375	1375	1375	1375
49	50207,UNEMPL	24924	2077	2077	2077	2077	2077	[illegible]
	50208,WK,CMP	70800	5900	5900	5900	5900	5900	5900
51	50209,SICK LVE	21052	1710	1654	1770	[illegible]	1774	1769
	50210,HOL	85242	6919	6688	7179	6964	7185	7165
53	50211,VAC	107108	8684	8381	9024	8742	9032	[illegible]
	50212,OTH PD ABS	7666	622	601	646	626	646	644
55	50213,UNIFORMS	4792	516	816	816	816	816	816
	502 TOTAL FRINGES	934048	76060	74409	77918	[illegible]	77961	[illegible]
57								
	SERVICES							
59	50302,MKT/PROMO SVCS	3000	250	250	250	250	250	250
	50303,PROF/TECH SVCS	26280	2190	2190	2190	2190	2190	2190
61	50304,TEMP HELP	2640	220	220	220	220	220	220
	50305,MT.CNTR MT SVCS	16320	1360	1360	1360	1360	1360	1360
63	50305,GA,CNTR MT SVCS	3180	265	265	265	265	265	265
	50306,CUST,SVCS	660	55	55	55	55	55	55
65	50307,SECURITY SVCS	4200	350	350	350	350	350	350
	50399,160,OTH SVCS	24000	2000	2000	2000	2000	2000	2000
67	503 TOTAL SVCS	80280	6690	6690	6690	6690	6690	6690

I	J	K	L	M	N	O	P	Q
JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER			
						$ HH	$/MO	% OF TOT
119649	129355	133892	138086	133287	129636	$10.19	$0.85	34.30
11691	11691	11691	11691	11691	11691	$0.91	$0.08	3.06
31471	32391	32391	32391	32391	33489	$2.42	$0.20	8.14
7774	7774	7774	7774	7774	7774	$0.57	$0.05	1.92
3087	3087	3087	3087	3087	3087	$0.24	$0.02	0.81
12518	12518	12518	12518	12518	12518	$0.97	$0.08	3.26
3462	3462	3462	3462	3462	3462	$0.27	$0.02	0.91
189252	199878	204416	208689	203811	211257	$15.58	$1.30	52.47
13847	14621	14551	15257	14907	15450	$1.14	$0.10	3.84
14467	15275	15621	15940	15575	16141	$1.19	$0.10	4.01
18000	18000	18000	18000	18000	18000	$1.37	$0.11	4.61
1100	1100	1100	1100	1100	1100	$0.08	$.01	0.28
705	705	705	705	705	705	$0.05	$.00	0.18
1375	1375	1375	1375	1375	1375	$0.11	$0.01	0.36
2077	2077	2077	2077	2077	2077	$0.16	$0.01	0.54
5900	5900	5900	5900	5900	5900	$0.45	$0.04	1.54
1667	1752	1788	1821	1753	1840	$0.14	$0.01	0.46
6741	7092	7241	7790	7221	7467	$0.55	$0.05	1.86
8450	8910	9107	9258	9080	9400	$0.69	$0.06	2.34
606	638	651	664	650	672	$0.05	$.00	0.17
816	816	816	816	816	816	$0.06	$0.01	0.21
75750	78260	79332	80323	79189	80948	6	1	20
250	250	250	250	250	250	$0.02	$.00	0.07
2190	2190	2190	2190	2190	2190	$0.17	$0.01	0.57
220	220	220	220	220	220	$0.02	$.00	0.06
1360	1360	1360	1360	1360	1360	$0.11	$0.01	0.36
265	265	265	265	265	265	$0.02	$.00	0.07
55	55	55	55	55	55	$.00	$.00	0.01
350	350	350	350	350	350	$0.03	$.00	0.09
2000	2000	2000	2000	2000	2000	$0.16	$0.01	0.52
6690	6690	6690	6690	6690	6690	$0.52	$0.04	1.75

OPERATING BUDGET:1984

A	B	C	D	E	F	G	H
	TOTAL	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
MATERIALS & SUPPLIES							
50401.FUEL/LUBS	666429	55230	51370	58018	55594	55584	[illegible]
50402.TIRES	72000	6000	6000	6000	6000	6000	6000
50499.OP.OTH MTLS	11076	923	923	923	923	923	923
50499,MT,OTH MTLS	122029	10471	9671	10864	10341	10630	[illegible]
50499.GA.160.OTH MTLS	19056	1588	1588	1588	1588	1588	1588
504 TOTAL MTLS/SUPPLI	890601	74212	69552	77393	74446	74725	[illegible]
UTILITIES							
505 TOTAL UTILS	23340	1945	1945	1945	1945	1945	1945
CASUALTY & LIABILITY COSTS							
50601.PHYS DAM INS	42900	3575	3575	3575	3575	3575	3575
50603.LIAB INS	110808	9234	9234	9234	9234	9234	9234
50606.DED PAYOUTS	816	68	68	68	68	68	68
50608.OTH INS	2856	238	238	238	238	238	238
506 TOTAL CAS/LIAB	157380	13115	13115	13115	13115	13115	13115
TAXES							
507 TOTAL VEH LIC	120	10	10	10	10	10	10
MISCELLANEOUS EXPENSE							
50901.DUES/SBSCR	3240	270	270	270	270	270	270
50902.TRVL	4152	346	346	346	346	346	346
50908.ADV/PROMO MEDIA	18480	1540	1540	1540	1540	1540	1540
50999,OTH DIR	5820	485	485	485	485	485	485
509 TOTAL MISC EXP	31692	2641	2641	2641	2641	2641	2641
INTEREST EXPENSES							
511 TOTAL INTEREST	44411	3701	3701	3701	3701	3701	3701
LEASES & RENTALS							
51210.OP FAC LS	2076	173	173	173	173	173	173
51212.GA FAC LS/RNTLS	15600	1300	1300	1300	1300	1300	1300
512 TOTAL LEASES/RNTL	17676	1473	1473	1473	1473	1473	1473
SUMMARY							
TOTAL EXP	4582671	374496	361187	387402	376394	384956	384264
TOTAL REVS	2117595	182155	158693	182126	177139	179431	178620
OPER DEFICIT	2465076	192341	202493	205276	199255	205525	205644
EXP/VEH HR	$29.71	$28.29	$29.54	$28.21	$29.79	$29.46	$29.56
EXP/VEH MI	$2.62	$2.50	$2.61	$2.50	$2.55	$2.51	$2.62
REV/VEH MI	$1.21	$1.22	$1.15	$1.17	$1.20	$1.22	$1.22
OPER RATIO	0.46	0.49	0.44	0.47	0.47	0.47	0.46
PAX	4168494	358573	312089	358516	348699	353210	351614
PAX/VEH HR	27.0	27.1	25.6	26.1	26.7	27.0	27.0

	I	J	K	L	M	N	O	P	Q
	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER			
69									
	50919	54092	56219	58423	56755	57854	$4.32	$0.38	14.54
71	6000	6000	6000	6000	6000	6000	$0.47	$0.04	1.57
	923	923	923	923	923	923	$0.07	$0.01	0.24
73	9286	9809	10153	10471	10107	10242	$0.79	$0.07	2.55
	1588	1588	1589	1588	1589	1588	$0.12	$0.01	0.42
75	69716	72412	74982	77405	75374	76607	6	1	19
77									
	1945	1945	1945	1945	1945	1945	$0.15	$0.01	0.51
79									
81	3575	3575	3575	3575	3575	3575	$0.28	$0.02	0.94
	9234	9234	9234	9234	9234	9234	$0.72	$0.06	2.42
83	68	68	68	68	68	68	$0.01	$.00	0.02
	238	238	238	238	238	238	$0.02	$.00	0.06
85	13115	13115	13115	13115	13115	13115	$1.02	$0.09	3.43
87									
	10	10	10	10	10	10	$.00	$.00	.00
89									
91	270	270	270	270	270	270	$0.02	$.00	0.07
	346	346	346	346	346	346	$0.03	$.00	0.09
93	1540	1540	1540	1540	1540	1540	$0.12	$0.01	0.40
	485	485	485	485	485	485	$0.04	$.00	0.13
95	2641	2641	2641	2641	2641	2641	$0.21	$0.02	0.69
97									
	3701	3701	3701	3701	3701	3701	$0.29	$0.02	0.97
99									
101	173	173	173	173	173	173	$0.01	$.00	0.05
	1300	1300	1300	1300	1300	1300	$0.10	$0.01	0.34
103	1473	1473	1473	1473	1473	1473	$0.11	$0.01	0.39
105									
	363294	380126	368305	385912	387949	398398	$29.71	$2.63	100.00
107	161542	154888	175725	185922	194353	176999	$13.73	$1.21	
	201752	225237	212580	199689	193595	221398	$15.79	$1.41	
109									
	$30.94	$30.65	$30.25	$29.91	$30.36	$30.77			
111	$2.74	$2.71	$2.68	$2.65	$2.69	$2.72			
	$1.22	$1.11	$1.21	$1.21	$1.35	$1.21			
113	0.44	0.41	0.45	0.49	0.50	0.44			
	317997	304899	345915	385674	382585	348424			
115	27.1	24.6	26.9	29.1	29.9	26.9			

DOCUMENTATION: CASH FLOW MANAGER

Application

Investment decisions may be supported by the detailed cash flow information provided by this template.

Use

Monthly projections of revenues by source, and of both operating and capital expenditures, are input. As the year progresses, actual revenue and expense information may be substituted for projections. This data is used to generate the actual or projected cash balance at the end of each month. Investment decisions can be input to produce data on total investment by month, and revised projections of available cash.

Notes

B5: Data. Beginning cash balance.

C5: (B57)

N5: (B5)

B7: Input data. Investments maturing during month. Includes carry over from the previous year plus current investments from rows 40 to 54.

Rows 10 to 14: Data. Actual or projected revenue per month from various sources.

B17: (B5+B7+B15)

N17: (N5+N7+N15)

Rows 20 to 23: Data. Actual or projected operating expenses per month.

Rows 27 to 32: Data. Actual or projected capital expenses per month.

B35: (B24+B33)

N35: (N24+N33)

B37: (B17-B35)

N37: (N17-N35)

Rows 40 to 54: Input data. Amount of investments made in each month. Amounts entered here should also be included in the total investments maturing (Row 7) for the month of maturity.

B55: Sum(B40...B54)

B57: (B37-B55)

N57: (B5+N7+N15-N35-N55)

B60: (2566000-B7+B55). Example uses starting investment balance of $2,566,000.

C60: (B60-C7+C55)

Variations

A simpler cash management tool is shown in the previous example.

CASH FLOW PROJECTIONS- 1984

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
CASH BEG MO*****	-271688	1723	29899	-73260	53391	51449	33162	-37170	72462	536892	1588762	1457762	-271688
INVEST MATURE	550000	1065000	716000	874000	735000	445000	430000	239000	746000	704000	150000	595000	7249000
REVENUE													
DEPOSITORY	25954			60000		91000	25000	30000	30000	30000	30000	30000	351954
INTEREST	12234	31730	12086	21058	27903	9736	8514	6894	19430	33172	20000	25300	228057
SALES TAX		814673		637094		644895		736512		615698		650292	4099164
FED GRANTS	11306	5193											16499
OTHER	1241	352						93000					94593
TOTAL REVENUE***	50735	851948	12086	718152	27903	745631	33514	866406	49430	678870	50000	705592	4790267
TOTAL CASH AVAI*	329047	1918671	757985	1518892	816294	1242080	496676	1068236	867892	1919762	1788762	2758354	11767579
OUTLAYS-EXPENSE													
PAYROLL	138572	136499	135785	132681	137742	142838	148611	140000	140000	140000	140000	140000	1672728
A/P OTHER	143752	168965	197756	174345	186794	151396	179400	151862	160000	160000	160000	160000	1994270
DIAL-A-RIDE	45000	20000	36000	41000		25000	25000	30000	30000	30000	30000	30000	342000
OTHER												93000	93000
SUB TOTAL*******	327324	325464	369541	348026	324536	319234	353011	321862	330000	330000	330000	423000	4101998
OUTLAYS-CAPITAL													
20 PASS BUS													0
40 FT BUSES								372912					372912
VAN POOL		82946	14329	1856	28252	107	27811						155301
SHOP EQUIP			724			104	1219						2047
E&H BUSES		107362											107362
MISC OFF EQUIP			1651	619	1057	473	1805	1000	1000	1000	1000	1000	10605
SUB TOTAL*******	0	190308	16704	2475	29309	684	30835	373912	1000	1000	1000	1000	648227
TOTAL OUTLAYS***	327324	515772	386245	350501	353845	319918	383846	695774	331000	331000	331000	424000	4750225
PROJ CASH BAL***	1723	1402899	371740	1168391	462449	922162	112830	372462	536892	1588762	1457762	2334354	7017354

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
39	INVEST DECISIONS													
	2/22 TO 3/23		380000											
41	2/28 TO 5/24		734000											
	2/28 TO 4/26		259000											
43	3/23 TO 6/22			445000										
	4/26 TO 8/23				239000									
45	4/29 TO 7/26				430000									
	4/29 TO 9/20				446000									
47	5/24 TO 10/25					411000								
	6/22 TO 10/25						294000							
49	6/30 TO 12/25						595000							
	7/29 TO 11/30							150000						
51	8/31 TO 9/30								300000					
	.													
53	.													
	.													
55	TOTAL INVEST****	0	1373000	445000	1115000	411000	889000	150000	300000	0	0	0	0	4663000
57	END BALANCE*****	1723	29899	-73260	53391	51449	33162	-37170	72462	536892	1588762	1457762	2334354	2334354
59	CUM INVEST													
	BEG BAL 2566000*	2016000	2324000	2053000	2294000	1970000	2414000	2134000	2195000	1449000	745000	595000	0	-2566000
61														

DOCUMENTATION: FARE STRUCTURE ANALYSIS

Application

This spreadsheet calculates a new fare level to generate a target amount of fare revenue, taking into account loss of ridership due to the fare increase. It also allows the user to project the revenue and ridership generated by a given fare structure.

Use

The current fares and ridership of each fare type are entered in the template, along with a target level of total revenue generation. The template uses successive calculations to calculate new fares which approach the target revenue amount. Since the calculated fares are likely to be uneven numbers, the user can then enter a new fare structure based on the "optimal fares" to test its effect on revenue and ridership.

The spreadsheet can be used to test various fare levels and fare structures in order to identify a combination of fare level and fare structure which minimizes ridership loss, while generating the desired level of revenue.

Assumptions

The fares in all zones are based on some relationship with the base fare in zone 1. In the example shown, the ratio between the various zone fares was maintained: all zone fares were increased by the same percentage.

The model uses the Simpson-Curtin rule to calculate ridership loss due to the fare increase: for every 3% fare increase 1% of riders will be lost.

Notes

General: The model uses successive recalculations to calculate fares approaching the desired level of revenue. For this reason the spreadsheet should be set to recalculate manually.

Note the instructions to users included in lines 34 to 40.

B6: Input data. Current fare for zone 1 in cents.

B28: (B6)

C6: Input data. Current annual zone 1 passengers.

C28: (C22)

D6: (B6*C6)/100, in dollars.

D23: Input data. Target revenue objective.

D28: (D22)

E6: Enter current zone 1 fare to set up template.

E7: (E6*(B7/B6)). Example assumes all fares will be increased by same percentage.

E22: (E24-I6)

E24: (E6)

E28: (E6)

F6: (H6*C6)

F28: (F22)

F29: (F28-C28)

F30: (F29/C28)*100

G6: (E6*F6)/100

G23: (G22-D23)*H23

G28: (G22)

G29: (G28-D28)

G30: (G29/D28)*100

H6: (1-(.33*(E6-B6)/B6)). A fare elasticity of .33 is assumed.

H23: 0 to set up template, 1 to run. See instructions.

I6: (E6*G23/D23)

J6: Input data. Proposed new fare for zone 1 in cents.

J28: (J6)

K6: (C6*(1-(.33*(J6-B6)/B6)))

K28: (K22)

K29: (K28-C28)

K30: (K29/C28)*100

L6: (J6*K6/100)

L28: (L22)

L29: (L28-D28)

L30: (L29/D28)*100

To run the spreadsheet follow the instructions in rows 34 to 40.

Variations

Numerous variations can be made to this spreadsheet. The template can be used to test fare structures without the targeting feature by removing columns E through I.

The relationship between the tested zonal fares can be changed to reflect various fare structures. For example, if a fixed increase between zones were desired, E7 would be (E6+25) for a 25 cent increase.

A separate column could be set up with target revenue levels for each zone. Fare adjustments would be calculated for all zones in column I.

Alternative elasticities can also be tested. If certain market segments are felt to be insensitive to fare levels, the elasticity factor in column H could be changed to 1 or the ".33" in the equation in columns H and K could be reduced.

Market segments by type of fare (Student, Elderly and Handicapped, or Adult) could be used instead of zone segments.

```
          A        B        C        D        E        F        G        H        I        J        K        L
    ____________________________________________________________________________________________________________
 1 |                                               FARE REVENUE PROJECTION PROGRAM
   |=============================================================================================================
 3 |                1980     BRTA    EXIST     TEST     TEST     TEST    ELAST     FARE      NEW      NEW      NEW
   |        ZONE    FARE     PASS     REVS     FARE     PASS     REVS     FACT      ADJ     FARE     PASS     REVS
 5 |-------------------------------------------------------------------------------------------------------------
   |           1      30   651436   195431    36.15   607348   219572     0.93  -0.0105       35   615607   215462
 7 |           2      50   158972    79486    60.25   148213    89305     0.93                50   148480    89088
   |           3      70    39698    27789    84.36    37011    31221     0.93                90    35955    32360
 9 |           4      90     6670     6003   108.46     6219     6745     0.93               110     6181     6799
   |           5     110     9970    10967   132.56     9295    12322     0.93               130     9372    12183
11 |           6     130      138      179   156.66      129      202     0.93               160      127      204
   |           7     150        8       12   180.76        7       13     0.93               180        7       13
13 | E&H
   |           1      15   158210    23732    18.08   147503    26663     0.93                20   140807    28161
15 |           2      25    32470     8118    30.13    30273     9120     0.93                30    30327     9098
   |           3      35     7626     2669    42.18     7110     2999     0.93                40     7266     2907
17 |           4      45      978      440    54.23      912      494     0.93                55      906      498
   |           5      55     1882     1035    66.28     1755     1163     0.93                65     1769     1150
19 |           6      65       90       59    78.33       84       66     0.93                80       83       67
   |           7      75        0        0    90.38        0        0     0.93                90        0        0
21 |-------------------------------------------------------------------------------------------------------------
   |                      1068148   355919       36   995858   399884   399884                     996888   397991
23 |                       GOAL-->  400000                       -116        1 <--FLAG
   |                                             36
25 |=============================================================================================================
   | RESULTS:
27 |
   | AMOUNT           30  1068148   355919       36   995858   399884                       35   996888   397991
29 | DIFF.                                             -72290    43965                                -71260    42072
   | %DIFF                                              -6.77    12.35                                 -6.67    11.82
31 |
   |=============================================================================================================
33 |
   | INSTRUCTIONS:
35 |            TO CLEAR PUT 30 IN F6, AND SET FLAG TO 0.
   |            ENTER DESIRED REVS IN E23 (GOAL), RECALC UNTIL CLEAR.
37 |            PUT +F22 IN F6 & SET FLAG TO 1 TO RUN.
   |            RECALC ABOUT 10 TIMES.
39 |            ENTER ANY FARES IN COLUMN K FOR NEW PASS AND REVS.
   |
41 |=============================================================================================================
   |
```

DOCUMENTATION: MONTHLY ROUTE SUMMARY

Application

Monthly revenue information can be used to generate ridership and performance statistics by route.

Use

Revenue, revenue miles, and platform hours for the month are input in columns F, G, and H. The spreadsheet generates cost, ridership, and performance statistics by route. Fare classification data by route must be available.

Assumptions

Operating costs are allocated to either hours or miles of service to generate the rates used (G23 and H23). The previous application shows one method of generating operating cost rates. Units used to develop the rates should be consistent with units in columns G and H (e.g., vehicle-miles vs. revenue-miles, etc.)

Notes

Rows 1-19 are the monthly report. Rows 20-35 contain background data used in calculating the figures in the monthly report.

A6: Route name or number.

B6: (E6*B23)

B23: Data from on-board fare classification counts. Total passengers paying student fares/total passengers on route 1.

B34: Data from on-board fare classification counts. Total passengers paying student fares/Total passengers.

C6: (E6*C23)

C23: Data. Passengers paying E & H fares/Total passengers on route 1.

C34: Data. Total passengers paying E & H fares/total passengers.

D6: (E6*D23)

D23: Data. Passengers paying adult fares/total passengers on route 1.

E6: (F6/F23)

E23: (B23+C23+D23) Check for value of 1.

F6: Input data. Fare revenues for analysis period for route 1.

F23: (B23*.4)+(C23*.3)+(D23*.6) Example uses fares of 40, 30, and 60 cents respectively for student, E&H and adult fares.

G6: Data. Scheduled monthly revenue miles on route 1.

G23: Data. Operating costs allocated by mile, mileage rate.

H6: Data. Scheduled monthly platform hours on route 1.

H23: Data. Operating costs allocated by hour, hourly rate.

I6: (E6/G6)

I17: (E17/G17)

J6: (G6*G23)+(H6*H23)

K6: (F6/J6)

K17: (F17/J17)

L6: (J6-F6)/E6

L17: (J17-F17)/E17

Variations

This format can be revised to use passenger counts by drivers. Data would be entered directly in columns B, C, and D.

Performance measures can be changed as desired.

JANUARY MONTHLY ROUTE SUMMARY: AVERAGE WEEKDAY

ROUTE	STUDENTS	E&H	ADULT	TOTAL PASS	TOTAL REVENUE	TOTAL MILES	PLATFORM HOURS	PASS/MILE	OPERATING COST	COST RECOVERY	SUBSIDY PER PASSENGER
1	32	145	2314	2492	1445	750	65.9	3.32	2603	0.555	0.46
2	56	104	3284	3444	2024	488	58.2	7.06	2045	0.990	0.01
3	14	19	278	311	178	238	19.67	1.31	798	0.223	1.99
4	368	742	8942	10052	5735	2968	234.88	3.39	9710	0.591	0.40
5	1088	1113	19958	22159	12744	5656	439	3.92	18306	0.696	0.25
6	183	460	9178	9821	5718	2069	177.85	4.75	7092	0.806	0.14
7	78	480	4555	5113	2908	1815	142.87	2.82	5920	0.491	0.59
8	258	812	5729	6799	3784	2250	170.59	3.02	7190	0.526	0.50
9	222	377	5600	6199	3562	1842	159.03	3.37	6330	0.563	0.45
10	245	846	7939	9030	5115	3203	240.05	2.82	10171	0.503	0.56
TOTAL	2544	5098	67777	75419	43213	21279	1708	3.54	70164	0.616	0.36

ROUTE	STUDENTS	E&H	ADULT		AVE FARE	MILEAGE RATE	HOURLY RATE
1	0.0128	0.0582	0.9289	1	0.5800	1.46	22.89
2	0.0163	0.0302	0.9536	1	0.5877		
3	0.0449	0.0609	0.8942	1	0.5728		
4	0.0366	0.0738	0.8896	1	0.5705		
5	0.0491	0.0502	0.9007	1	0.5751		
6	0.0186	0.0468	0.9345	1	0.5822		
7	0.0153	0.0939	0.8909	1	0.5688		
8	0.0379	0.1194	0.8426	1	0.5566		
9	0.0358	0.0608	0.9034	1	0.5746		
10	0.0271	0.0937	0.8792	1	0.5665		
SUMMARY	0.0337	0.0676	0.8987		0.5730		

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